Biorhythms: Evaluating a Pseudoscience

William Sims Bainbridge

One of the most interesting current popular fads is a pseudoscience called *biorhythms*. It asserts that the life of every person is shaped by three precise biological rhythms that begin at birth and extend unaltered until death. The biorhythm theory has gained credence with many thousands of people, but is also interesting as a potential research tool for examining the general characteristics of pseudosciences. The theory is unusual in its conceptual clarity. It is not only amenable to empirical test, but also useful for exploring factors that lead people to accept a theory despite the lack of true scientific evidence. This article examines biorhythm theory, uncovers some sources of its persuasiveness, then reports on nine statistical studies that failed to support it.

To inform myself fully about biorhythms, I purchased several books and calculating devices, then enrolled in a biorhythm course taught by Mr. Benjamin Steele (pseudonym) at the experimental college attached to the University of Washington, where I teach. After this course I became a member of the Northwest Biorhythm Association, headed by Mr. Steele. He taught that biorhythms was "our newest science," although "the scientific world just hasn't recognized it yet." He was proud to say, "People into biorhythms are forerunners of a new science and a new age." Steele is also very much involved in astrology, but does not advertise this fact. "I like to keep biorhythms away from astrology, because there's so much skepticism where astrology is concerned." Over the years he has explored several religious denominations, but was never entirely satisfied until he discovered biorhythms: "I can believe that these things are real." Other teachings left him with doubt. "The difference here is, it's observable. I can see

it." So far, Steele has only proved biorhythms in his own life, but says, "At the present time, I am involved with several biorhythm research projects."

"The essence of the biorhythm theory is that from the moment of birth all human beings are programmed by nature to have cyclical ups and downs," Steele explained. "The theory suggests that man's behavior is characterized by three innate cycles. The cycles include a 23-day physical cycle, a 28-day emotional or sensitivity cycle, and a 33-day intellectual cycle. The physical cycle influences tasks of a physical nature: physical strength, endurance, energy, resistance, and confidence. The emotional curve takes on increased importance in situations of high emotional content: sensibility, nerves, feelings, intuition, cheerfulness, moodiness, and creative ability. And the intellectual cycle is of particular importance in pursuits requiring cognitive activity: intelligence, memory, mental alertness, logic, reasoning power, reaction, and ambition."

Each cycle begins at the moment of birth, then oscillates up and down with absolute precision for the entire life. "When our cycles are 'high,' we're most likely to be at our best. When our cycles are 'low,' the opposite is true. But beware of 'critical days'—they occur whenever our cycles are changing. These are unstable days on which we're easily distracted and most prone to accidents." This is the theory. Mr. Steele teaches his students three methods of calculating biorhythms: hand calculation, the use of prepared tables and charts, and the use of the Biolator calculator.

The Biolator is a $30 electronic calculator manufactured by the Casio company. This device is so convenient to use that it makes testing biorhythm theory a very simple job. To perform a calculation, the user simply punches the target data into the Biolator, then the date of birth of the person in question, then presses the BIO button. The Biolator immediately flashes three two-digit "guide numbers" on its display, one for

Table 1
Interpretation of Calculations Using the Biolator

Cycle	Days in Cycle	High Days	Low Days	Critical Days
Physical	23	2-11	13-23	1 & 12
Emotional	28	2-14	16-28	1 & 15
Intellectual	33	2-16	18-33	1 & 17

each of the three rhythms. In operation, it counts the number of days from the person's birth to the target day, separately divides this number by 23, 28, and 33, and displays the remainder from each of these three long divisions. The guide number indicates how far into a new full cycle the target day is. For example, 01-12-24 means that the target day is the first day of a physical cycle, the twelfth day of an emotional cycle, and the twenty-fourth day of an intellectual cycle. Casio provides a little chart that tells the user whether each guide number indicates a high, low, or critical day. In all my calculations for this article, a total of about 2,500, I employed a Biolator and followed Casio's reasonable conventions for rounding off half-days. The only limitation imposed by the Biolator is that all dates must fall between January 1, 1901, and December 31, 1999.

Believing Biorhythms

It is easy to see why Steele himself believes the theory: his self-esteem has been boosted by involvement in biorhythm work. Steele used to play professional football, a grand but uncertain career. Steele's coaches continually found fault with his performance, and he couldn't seem to satisfy them. He happened across a copy of George Thommen's book *Is This Your Day?* This paperback is "the biorhythm Bible," and has sold over 100,000 copies. It explained to Steele that the ups and downs in his performance were not his fault, but caused by unalterable natural rhythms. Then his football career ended. For a while he held an administrative job at our university. When this job also terminated, he found solace in biorhythms. He began teaching the experimental-college course, then launched the Northwest Biorhythm Association. Calling himself a "biorhythm engineer," he claimed professional status, hoping to achieve honor and income in a wonderful new career.

Biorhythm theory is ideal material for a pseudo-profession. The technique of calculation has to be learned, but is relatively simple. There already exists a body of biorhythm literature, containing many subtle variations on the basic theory, permitting the pseudo-professional to acquire a rich fund of specialized "knowledge." Biorhythms are numerologically very efficient. A tiny input of real information (the birth date) produces a high output of pseudo-information (daily biorhythms). The three numbers 23, 28, and 33 have no common factors, so the pattern of cycles does not repeat exactly for $23 \times 28 \times 33 = 21{,}252$ days, a little over 58 years.

Many people seem interested in making money from biorhythms.

Several publishers have brought out books to compete with Thommen's. Mr. Steele earns $7 from each student in his course, and sells personalized biorhythm charts for $4. A "Biotimer" in Delaware charges $5 for an annual chart. A New York service charges $7.95, while Biorhythm Profiles, in Texas, asks $7.50. The co-founder of one of these enterprises admitted: "We have conducted no extensive research ourselves, being occupied with other concerns. My partner was admitted to the bar last year, and I am working toward my Ph.D. in linguistic anthropology at the University of Texas. We founded the business in July 1973 after reading an article on the subject in *Science Digest*, which makes us one of the oldest firms in the country." I interviewed a young computer consultant at our university who has invested around $1000 devising a computer program to generate really nice-looking biorhythm charts, drawn by a four-color automatic plotter, showing the rhythms as three tall, interlacing sine waves. He says he has no opinion about the validity of the theory, but believes he can make a lot of money selling the charts. This fellow first learned about biorhythms in a *Newsweek* article that proclaimed: "Americans are flocking to the new fad. Lester Cherubin, president of Time Pattern Research, Inc., says his company has sold 100,000 biorhythm printouts ($10 to $20 each) in the three years" (Cowley, 1975). The basic computer program for cranking out biorhythm charts was published in *Byte*, a popular computer magazine (Fox and Fox, 1976).

It is obvious why the biorhythm seller wants to sell. Why does the buyer buy? The advertising on the biorhythm books at least expresses the publishers' theories about the appeal of this pseudoscience. One carries the subtitle, "How to Understand and Predict the Cycles in Your Mind and Body That Hold the Key to Success and Happiness." Another urges the prospective buyer: "Take advantage of your body's natural cycles and lead a happier, more successful life." Another pledges to be "quick and easy," permitting an otherwise bewildered reader to "understand and interpret the life cycles that determine how you feel." The blurb on Thommen's book makes a similar pitch: "Tune in to your natural rhythm—and discover a richer, more secure way of living—with the one book you need for *all* the days of your life!"

The typical biorhythm book attempts to prove its case through many examples showing how biorhythms seem to explain events in the lives of famous persons. Aviator Charles Lindbergh died on a critical day in his emotional rhythm. When President Ford pardoned Richard Nixon, he was low in both the emotional and intellectual rhythms. Marilyn Monroe

killed herself near critical days in both of these cycles. Swimmer Mark Spitz won seven Olympic gold medals near physical and emotional highs. I suspect that the authors of these books calculated rhythms for many famous people at important days in their lives and reported only the ones that appeared to support the theory. But these chosen cases also exemplify another favorite tactic of pseudoscientists when they want to appeal to the public: they concern exciting stories about famous people. The average reader, not used to thinking in statistical terms, will be impressed by a collection of vivid, personalistic images.

The books have a nice excuse for failing to prove their claims: they are merely popularizing the findings of other men. Biorhythm theory was supposedly invented and thoroughly tested by three European researchers near the beginning of this century: Wilhelm Fliess, Hermann Swoboda, and Alfred Teltscher. Fliess was a close friend of Sigmund Freud. Indeed, the Japanese manufacturer of the plastic Biomate calculator incorrectly asserts, "The science of Biorhythm, established by Professor Sigmund Freud, a leading psychiatrist of the early 20th century, has been studied by scholars worldwide to become a proven science."

Unfortunately for us, the chief "scientific evidence" cited by Thommen and the other biorhythm authors is entirely unavailable for our inspection. Not a single one of the relevant sources listed in Thommen's bibliography is available in the library of our university. We have Freud's letters to Fliess, but not the replies or anything else Fliess wrote. According to Cohen, "By and large, Fliess' medical and scientific colleagues ignored his book. Some of them even attacked his ideas and the statistics upon which they are based" (Cohen, 1976, p. 20). Whatever the merit of Fliess's work, we cannot inspect it directly. Although Thommen says he corresponded with Swoboda at length, he never saw much of the basic evidence:

> In one of his letters, Dr. Swoboda indicated that eight trunks of research documentation that he had stored in the vaults of the University of Vienna fell into the hands of Russian troops during the occupation of Vienna in 1945. This loss was a bitter blow to Swoboda. (Thommen, 1973, p. 7)

It may have been a bitter blow to Swoboda, but it was a great advantage for the progress of biorhythms. Proponents can cite a wealth of evidence that no one can check. The 33-day intellectual rhythm rests entirely upon the research of Alfred Teltscher, but Thommen himself admits:

> Unfortunately, my own search abroad brought to light no original documentation, scientific paper, or book of his, and so my knowledge of Teltscher's work is based on secondhand reports and on articles that discussed his findings. (Thommen, 1973, p. 18)

The biorhythm books cite not only unavailable studies but also irrelevant publications. Conventional scientists use the term *biorhythms* to refer to any roughly periodic changes in a biological organism. The best known are the *circadian rhythms*, approximately a day in length. In many species these rhythms persist even when the organism is screened from the environmental influences of day and night. Natural daily and annual cycles are imprecise and are set by the rotation and revolution of the earth, not by the organism's moment of birth. These biological rhythms exist, but do not exhibit the characteristics claimed for pseudoscientific biorhythms. Authors of the books tend not to make this clear. Arbie Dale, for example, supports the theory in his book *Biorhythm* with an appendix listing supposedly confirming studies. In fact, not a single one of the thirty-one publications listed that date from after World War II has anything at all to do with the 23-28-33 day.

To get perspective on public acceptance of biorhythms, I conducted a research project with the help of undergraduate students at my university. Pseudoscience is one of the topics included in the introductory Sociology of Deviance course I teach two or three times a year. I always perform experiments with my students, both to show what real science is like and to inoculate them against pseudoscience. At one class, in November 1976, I ran the movie *In Search of Ancient Astronauts*, which spreads Erich von Däniken's quack theory. The next day I lectured for fifteen minutes presenting biorhythm theory as if it were an entirely respectable social-scientific perspective. Then I gave the class a questionnaire. After they had filled it out, I debriefed them, using the evidence presented later in this article to debunk biorhythms. The following day I dealt with von Däniken. The questionnaire allowed me to develop several hypotheses about pseudoscience.

The first question asked was: "Do you tend to agree or disagree with the biorhythm theory just presented in class?" Of course many students may have believed the theory simply because it was presented by an intellectual authority, their professor. But I had previously presented several sociological theories in the same manner and then argued against them, so the students were presumably used to the hypothetical statement of

theories before they were demolished by evidence. Thus I had some reason to be shocked by the result. Only 5.3 percent of the 113 students felt "the theory is almost certainly true," but a huge 61.9 percent said it "is probably true"! Fifteen percent felt "the theory is probably false," while only 3.5 percent were sure it "could not possibly be true," and 14.2 percent had no opinion. That is, 67.2 percent accepted the theory, while only 18.5 percent rejected it, a ratio of nearly four to one!

In another part of the questionnaire, I asked students to judge six theories, biorhythms among them, and indicate on a scale of zero to 100 percent the "chance each theory is true." On the average, biorhythm

Table 2
Students' Acceptance of Six Controversial Theories

Theory	Average "Chance Theory is True" (Expressed as a Percent) All Students	Deeply or Moderately Religious Students	Students Who Are Indifferent or Opposed to Religion
Darwin's theory of evolution	69.8%	62.7%	78.8%
The theory that there is intelligent life on other planets	69.2%	67.1%	71.8%
The theory that "extrasensory perception" (ESP) exists	64.4%	67.1%	61.0%
Biorhythm theory	61.8%	61.7%	61.8%
Von Däniken's theory about ancient astronauts	50.9%	51.0%	50.8%
The theory that miracles actually happened just as the Bible says they did	44.1%	61.1%	22.6%
Number of Students =	113	63	50

theory scored 61.8 percent, only 8 percent behind the score of Darwin's theory. One common hypothesis contends that pseudoscience is really a vestige of traditional religious belief. With this in mind, I asked students how religious they considered themselves: deeply, moderately, largely indifferent to religion, or basically opposed to religion. Religious students were more likely to favor belief in biblical miracles and in ESP and to reject Darwin's theory. It is possible that belief in an immortal soul, or in the possibility of God and his angels speaking to men's minds, makes acceptance of ESP more likely. Religious students were not even the slightest bit more likely to accept von Däniken's theory or biorhythms. This suggests that religiosity is not tied to gullibility, but merely to specific attitudes toward some specific theories.

At the end of the questionnaire I included a page designed to explore the way people respond to their own personal biorhythms. Early in the course, most students gave me their birth dates. Now I told them I had calculated their biorhythms for the day of the questionnaire, and indicated on the last page whether each of the respondent's three rhythms was "high," "low," or "critical." For each one, the student was asked, "On the whole, is this calculation of your rhythm an accurate description of the way you are today?" He was supposed to answer by checking either a "yes" or "no" box.

I actually gave each student only "high" or "low" indications according to the flip of a coin—perfectly meaningless, random "rhythms." However, I believe I convinced almost every student that the rhythms were correctly calculated.

How did students respond to these fake personal biorhythms? Only 5.6 percent of the 108 students checked three "no" boxes, rejecting all three rhythms. Twelve percent checked one "yes" box and two "no" boxes, while 37 percent checked two "yes" boxes and one "no" box. A big 45.4 percent checked all three "yes" boxes! We would expect the student to accept exactly half of these flip-of-the-coin fake rhythms. "High" was supposed to mean "better than average," and "low" was "worse than average." Thus, the average number of "yes" responses should be 1.5 out of the 3.0 maximum possible. In fact the average was 2.24! Students were about as likely to accept "high" fake biorhythms as "low" ones. These results suggest that people do not carry an accurate scale of their personal conditions in their heads. They do not have a well-calibrated "average" against which to compare statements about whether they are currently above or below average. Thus, they are susceptible to

spurious influences when asked to make such judgments (Bachrach and Pattishall, 1960; Schachter and Singer, 1962).

Religious students were not more likely than nonreligious students to accept the fake biorhythms. The sex of the student did not make a significant difference here either. One item in the questionnaire asked, "Were you already familar with biorhythm theory before today?" Only 4.6 percent said they were already "very familiar," but a full 53.8 percent said they were "somewhat familiar." Apparently many students have heard about this pseudoscience, but few, as yet, have become deeply involved in the fad. Those previously familiar and previously unfamiliar were equally likely to accept their fake rhythms.

One variable was highly associated with the tendency to accept the fake personal biorhythm: whether the student had been relatively convinced by the lecture on the theory. Those who gave 0, 1, or 2 "yes" responses to their fake rhythms on the average estimated the "chance" biorhythm theory is true at 56.3 percent, while those who gave three "yes" responses, accepting all three fake rhythms, gave an average response of 66.7 percent. We know that differential acceptance of the theory comes first, causally, because the last page of the questionnaire was sealed by another piece of paper until after all students had completed the rest of the questionnaire. Only after completing all the other questions did a student see his fake rhythms and evaluate them. One can imagine the following vicious cycle. Some people are open to the theory. A book on the theory, written in an appealing and authoritative style, makes them think it is probably true. They calculate their personal rhythms, and are particularly likely to accept them. Thus gullibility may operate in a complex way. A gullible person not only may accept a theory because it is stated authoritatively, but also may misperceive in a way to find "independent evidence" for the theory. Such a person may say, "Sure, I thought it was a pretty good theory to start with. But, look! Now I have tested the theory on my own experience and proved it was true."

Testing Biorhythms

Data suitable for testing biorhythm theory scientifically can be found in almost any large bookstore. Several sports encyclopedias contain not only information about wins and losses but also the birth dates of sports stars. A. James Fix was able to test the theory using data from *Baseball Digest* (Fix, 1976). I used information in *The Encyclopedia of Golf* and *The*

Table 3
Four Biorhythm Sport Studies

Arnold Palmer	Percent of 243 Winning Days on Biorhythm Highs		
Cycle	Expected	Actual	*z* scores and significance
Physical	43.5%	30.0%	4.245 (1/10,000)
Emotional	46.4%	45.7%	0.219 N.S.
Intellectual	45.5%	47.3%	0.563 N.S.
Women Golfers	Percent of 229 Winning Days on Biorhythm Highs		
Cycle	Expected	Actual	*z* scores and significance
Physical	43.5%	51.5%	2.442 (1/69)
Emotional	46.4%	46.3%	0.030 N.S.
Intellectual	45.5%	44.5%	0.304 N.S.
Men Golfers	Percent of 143 Winning Days on Biorhythm Highs		
Cycle	Expected	Actual	*z* scores and significance
Physical	43.5%	46.9%	0.820 N.S.
Emotional	46.4%	41.3%	1.223 N.S.
Intellectual	45.5%	42.0%	0.840 N.S.
Baseball Pitchers	Percent of 95 No-Hit Games on Biorhythm Highs		
Cycle	Expected	Actual	*z* scores and significance
Physical	43.5%	37.9%	1.098 N.S.
Emotional	46.4%	49.5%	0.606 N.S.
Intellectual	45.5%	43.2%	0.451 N.S.

Baseball Encyclopedia. Biorhythm theory holds that athletes are in best form and most likely to win on high days in their three cycles. In four of my studies I calculated athletes' biorhythms for a large number of days on which they won, and inspected the frequencies of highs in all three rhythms.

Biorhythm books by both Thommen and Cohen cite the record of golfer Arnold Palmer as evidence in favor of the theory. Palmer won the British Open at the beginning of July 1962, when he was high in all three rhythms, and lost the PGA two weeks later when he was low in all three. Selected examples cannot prove probabilistic theories, but such theories are susceptible to statistical test. I tabulated biorhythms for all 243 days of the American golf tournaments Palmer won from 1955 through 1971. Only one of the three rhythms, the physical, shows what appears to be a significant departure from the incidence that would be expected by chance. Palmer won far *less* often on physical high days than expected by chance, the opposite of what biorhythm theory predicts! Should we now become supporters of an *anti*-biorhythm theory, the exact opposite of Thommen's? No. The estimate of statistical significance used, the z test, is really not appropriate here. It assumes that each day in our sample is an isolated case, entirely independent of each other day. But golf tournaments cover several days. Palmer won only 59 different tournaments, so the 243 days are not 243 independently selected cases.

Here the error works against biorhythm theory, but sometimes a similar error may inappropriately convince someone the theory is true. A person may feel that a whole series of days exactly fits his rhythms, counting the days as individual pieces of evidence even though they are linked together and there may have been only a couple of actual changes over the period. The Palmer study turned up another artifact. Only one of the 243 winning days came on an emotional "critical day"—0.4 percent versus the expected 7.1 percent of the time. This appears to be statistically highly significant, but the following argument shows that the finding is spurious. Arnold Palmer was born September 10, 1929, a Tuesday. The emotional cycle is 28 days long, exactly four weeks. Therefore, Palmer's emotional critical days always fall on Tuesdays. Golf tournaments are scheduled to cover weekends, and seldom last through Tuesday. Spurious finding indeed! People may find much in the course of their emotional lives that appears to support the theory because the emotional rhythm is synchronized with the cultural rhythm of the week (Melbin, 1960).

I performed a similar study looking at the biorhythms of 31 women

golfers on the last days of 229 tournaments they won. Here the physical rhythm appears to give a little support to the theory. But we really don't know that the 229 winning days were entirely independent cases. Some golfers had winning streaks, and the records of the women varied greatly. To exclude the nonindependence error altogether, I did another study calculating the biorhythms of 143 male golfers for the last day of the first tournament won by each of them. Now none of the figures is significantly different from what would be expected by chance. The last sports performance study looked at 95 no-hit major league baseball games won by 75 different pitchers. Since these games were widely spaced, they do represent 95 independently chosen cases. Here again there is no evidence for biorhythm theory.

Table 4
A Death Study and a Birth Study

Pitchers' Deaths	Percent of 274 Deaths on Low Biorhythm Days		
Cycle	Expected	Actual	*z* scores and significance
Physical	39.1%	38.0%	0.373 N.S.
Emotional	39.3%	39.4%	0.034 N.S.

Pitchers' Deaths	Percent of 274 Deaths Within One Day of the Critical Biorhythm Day		
Cycle	Expected	Actual	*z* scores and significance
Physical	26.1%	25.5%	0.226 N.S.
Emotional	21.4%	21.5%	0.040 N.S.

Mothers Giving Birth	Percent of 565 Births Within One Day of the Critical Biorhythm Day		
Cycle	Expected	Actual	*z* scores and significance
Physical	26.1%	27.6%	0.833 N.S.
Emotional	21.4%	20.4%	0.580 N.S.

Astrologers and other pseudoscientists are rightfully reluctant to predict their clients' deaths. The biorhythm books warn the reader not to use the method for this somber purpose. Nevertheless they claim that death occurs much more often at low or critical days in the emotional and physical cycles and give supportive examples of famous deaths. I calculated the rhythms of 274 major league baseball pitchers for the days of their deaths, and I found nothing. In this study and the next I gave the theory the best chance by including the days either side of the critical day itself, on the possibility that some cases might just miss biorhythm targets.

Biorhythm theory also predicts that mothers are most likely to give birth on critical days in the physical and emotional cycles. For data to test this idea I turned to the birth data published by statistician Michel Gauquelin. Some believers in the occult suspect that only data collected by a fellow believer will have a sufficiently friendly spirit to prove an occult theory. Perhaps all the golf and baseball data are too pedestrian, unsaturated by occult influences. Although this idea makes no sense to a scientist or statistician, I decided it would be only fair to use one body of data that had come from a sympathetic source. I calculated the rhythms of 565 French mothers for the date of birth of their first child, taking all the cases where the mother was born after 1900 from one of Gauquelin's data volumes. I found no evidence in favor of biorhythm theory. The 5.0 percent of the cases that fell right on emotional critical days almost achieves the 0.05 level of significance—in the wrong direction for the theory.

All six of the studies above were based on public data. Anyone can reproduce them. The three concluding studies were based on data collected from students in my large Sociology of Deviance class. Anyone with a similarly big class could replicate them. Because the two preceding studies had ignored the intellectual rhythm, I decided to test it alone.

My first intellectual study analyzed scores my students achieved on two multiple-choice tests held 16 days apart. Because the intellectual cycle is 33 days long, most students were high on the rhythm for one test and low on the other. Therefore I was able to compare each student with himself. A majority had given me their birth dates earlier, without any knowledge of the use to which I would put them. The tests were graded by my teaching assistant, also without knowledge of my study. A total of 105 students took both tests, had given me their birth dates, had a high rhythm for one test and a low one for the other, and scored higher on one test than on the other. The chi-square of the table is 1.28, in the direction opposite to the theory, but not significant anyway.

My biorhythm mentor, Mr. Steele, pointed out to me that his theory might make a more complex prediction than the one just tested. Of course, he said, students should perform best when their intellectual rhythms are high. But they should also *learn* best when the intellectual rhythm is high. Thus they would be expected to do best near the end of the high period, when they have been in top form for several days of studying as well as for the test itself. Similarly, they should do worst near the end of the low period. I calculated the biorhythms of 150 students for the day of the midterm exam. I have divided the students into four groups, according to which quarter of the intellectual cycle each was in. As the table clearly shows, biorhythm theory flunks again.

Table 5
105 Students' Intellectual Biorhythms on Two Tests

		Test on Which the Biorhythm Was High	
		First	Second
Test on Which the Student Scored Higher	First	17	35
	Second	23	30

The last study was suggested to me by Mr. Steele. He said one of his main research projects was intended to test the hypothesis that biorhythms can be used to predict the sex of children. Biorhythm author Robert E. Smith says:

> The biorhythm theory states that when the physical biorhythm is high in the female at the time of conception, the egg cell is more likely to accept the male sperm cell and produce a boy. When the emotional biorhythm is high in the female at the time of conception the egg cell is more likely to accept the female sperm cell and produce a girl. (Smith, 1976, p. 45)

In a book on occult influences in the work of Freud and Jung, Nandor Fodor comments on the sexual aspect of Fliess' biorhythm theory:

> As to Wilhelm Fliess, he was started off on his flight of ideas by his "discovery" of a "nasal reflex neurosis," a new syndrome that he announced in

1897, claiming that dysmenorrhea was of nasal origin and that behind menstruation there was a wider process, a tendency toward periodicity in all vital activities of both sexes. The key to this periodicity was hidden in the numbers 28 and 23. The first number patently stands for the normal period of menstruation. The second may have been derived, so Jones believes, from the interval between the close of one and the onset of another. As Fliess considered all human beings bisexual, 28 was the female component and 23 the male one. These numbers were said to operate in all organic beings, and determined the biological phenomena of growth (including the sex and date of birth of the child), the date of illness, the date of death, going even beyond the human sphere to the realm of astronomy. (Fodor, 1971, 71)

Table 6
150 Students' Intellectual Biorhythms for an Exam

Quarter of the Cycle	Number of Students	Average Grade	Biorhythms Predict	Actual Result
I (high)	36	86.7%		LOWEST
II (high)	40	87.7%	HIGHEST	
III (low)	43	88.2%		
IV (low)	31	88.9%	LOWEST	HIGHEST

Mr. Steele was hoping to demonstrate the utility of biorhythms for predicting sex by collecting information on the births of a number of children. Then he would count back 280 days from the birth to estimate the date of conception, a practice endorsed by Smith, and calculate the mother's physical and emotional rhythms for that day. If one rhythm was high and the other low, the high one would determine the sex of the child. When he first told me about this project, Steele had collected information on only a half-dozen cases. He keeps his data and performs his calculations in an extremely messy fashion, so it was hard for me to follow his procedure, and I was not confident in his methodology. But I offered to provide him with all the data he needed. The students in my large class filled out a new questionnaire, giving information on their own births and on those of people close to them about whom they accurately knew the facts, a total of over 300 births. I excluded all those for which a difficult labor, induced birth, or Caesarean birth was reported. Excluding a few more at random to arrive at a nice round number, I ended up with good information about

the births of 100 males and 100 females. I gave Mr. Steele the 200 birth dates to see how well he could predict sex. Despite all his boasts that he was a biorhythm engineer and researcher, he was not able to complete this simple research, at least not during the three months I was prepared to wait.

I analyzed the birth data myself. In 104 of the 200 cases, biorhythm could not make a prediction because the physical and emotional rhythms were both high, both low, or one was critical. The other 96 were good for confident predictions from biorhythm theory. I compared the predictions with reality. In 48 cases the sex prediction was correct. In 48 cases the sex prediction was not correct. This is exactly the 50 percent we would expect by chance. Steele's imaginative wife had an ingenious explanation for the cases when biorhythms fail to predict the sex of the child: Perhaps these kids grow up to be homosexuals, because their sexual identity is confused!

Conclusions

We have seen several reasons why people might believe in biorhythm theory, but scientific tests give absolutely no empirical support. Those who spread the rumor that the biorhythm theory is correct, whether through books, courses, or private conversation, are acting irresponsibly. The best evidence currently available strongly indicates that this biorhythm theory is without value.

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