AN ABSTRACT OF THE THESIS OF

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in General Psychology: Clinical Emphasis presented

on December 4, 1981

Title: BIORHYTHMS AND DECISION-MAKING

Abstract approved: Cooper B Holmes

This study investigated the relationship between biorhythm theory and decision-making. Biorhythm promoters claim behavior is influenced by a trio of biological rhythms which control the availability of energy to inner resources through alternating cycle phases. The strongest emphasis is upon "critical" days when cycles change direction since it is at this time the organism is most unstable and prone to erratic behavior. Decision-making is a behavior where the major behavioral impetus would come from internal sources and would thereby serve as an example of behavior under biorhythmic influence.

The decision by Vietnam era Army enlistees to commit the offense of absence without leave (AWOL) was the behavior observed. A sample of 104 subjects was gathered from the 1978 military discharge review files. Subjects were placed into groups determined by whether the decision to go AWOL was made on biorhythmic critical days or non-critical days. Chi

Square procedures were used to analyze the observed frequencies of critical day AWOLs. The alpha level was .05 with two levels for the independent variable. Analyses were performed separately for each of the three biorhythm cycles and for a combined cycle total. Unavailability of exact birth and departure times were compensated for by using the median times of the four birthdate quarters and selecting seven potential departure intervals. Analysis was performed on the mean value of the four birth times for each departure interval.

No significant relationships were found for any of the individual cycle analyses. Three of the twenty-eight base measurements in the combined cycle analysis were significant, but were determined insufficient basis to modify the overall statistical findings. The null hypothesis of the study was retained. Recommendations were made for further and more comprehensive study. Also, original resources should be located since the reliability of commercialized publications is questionable.

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BIORHYTHMS AND DECISION-MAKING

A Thesis

Presented to

the Department of Psychology

EMPORIA STATE UNIVERSITY

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

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December, 1981

ACKNOWLEDGMENTS

I take this opportunity to extend my gratitude to my committee members Dr. Joseph Barto, Dr. Ray Heath, and Dr. Cooper Holmes for their invaluable assistance with this project. Special mention is warranted for Dr. Dal Cass and Dr. William Scales for their motivational support and to Cyntha Robison for her technical skills.

To my wife Charlotte, I can only offer my undying love for her warmth, patience, and understanding throughout the peaks and valleys encountered while undertaking this project. And last, but not least, I thank my son Ray III, for it was his very presence which provided the energy to see this through to completion.

TABLE OF CONTENTS

Table of Contents—continued

LIST OF TABLES

Chapter 1

INTRODUCTION

The general focus of this research was to determine if biorhythmic critical days have an influence on decision-making. Specific attention was given to a sample group of soldiers who were absent without leave from their assigned duty installation.

The first chapter offers a simplified explanation of biorhythms and their theoretical application to the process of decision-making. This is followed by a description and statement of the problem and the operational hypothesis as it pertains to the selected sample. Brief narratives concerning the purpose and significance of the study are also included as well as a discussion of primary assumptions and their rationale. For convenience and clarity, a list of definitions of terms frequently utilized has been added. The final section considers the limitations imposed by the sample in establishing parameters within which to evaluate the conclusions of the study.

Theoretical Formulation

During the last century, numerous theories have evolved which proclaim they have the solution as to why man behaves as he does. While no theory has achieved universal acceptance, many have contributed significant pieces to the puzzle of man's behavior. At the very least they have provoked questions to be answered and new ideas to be experimentally tested. One such theory is biorhythms.

Biorhythm is not a new theory, but it has undergone a strong resurgence in recent years. The theory is based upon the premise that there exists within man a series of three biological rhythms which serve as regulators for the distribution of energy to inner resources. Gale has hypothesized the existence of a fourth biorhythm cycle, but this concept has not been statistically tested.[1] The rhythms are self-sustained cycles which alternate in comparable fashion to household electricity. The period or length of the cycle is divided in two consecutive phases; a positive phase and a negative phase. Specific inner resources are at optimum and minimum strengths during their respective phase of each cycle. Behaviorally this would mean that during the positive phases one's energy levels are at a high point and more ambitious projects may be achieved. Conversely, during the negative phases the energy levels are lower, therefore more conservative tasks should be attempted. In either phase the rhythm follows a smooth course and is stable. The weak points of the cycle occur during the change from high to low and back again. It is when this change takes place that the cycle is in a state of transition and is unstable. These points of change are called critical days.

Biorhythmic critical days are the heart of biorhythm theory. The proponents of biorhythms place lesser emphasis upon the highs and lows of the cycles. They claim the true danger to the organism is on the critical days because of the instability at the time of alternation. Thommen explains, "The change may be compared with an electric light

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[1]Mort Gale, Biorhythm Compatibility (New York: Warner Books, 1978), p. 22.

bulb in that the most frequent times the bulb's filament burns out is when it is switched on and off."[2]

The three biorhythmic cycles that control the inner resources are the physical, emotional (or sensitivity), and intellectual rhythms. The physical rhythm has a period of twenty-three days and is responsible for behavioral aspects such as strength, endurance, and physical speed. It has critical days on the first day of a new cycle and eleven and one-half days later as the cycle shifts into its second phase. The emotional rhythm is twenty-eight days full cycle with critical days falling on the first and fifteenth days. Examples of its area of control are emotions, moods, and stress resistance. The intellectual rhythm is thirty-three days long with criticals on the first day and every sixteen and one half days thereafter. Perception, memory recall, and concentration typify its domain. All critical days are said to last twenty-four hours.

The method in which critical days affect behavior is simple. All three rhythms function simultaneously and harmoniously. When one cycle is undergoing a critical day it disrupts the harmony of all three cycles which in turn disrupts the utilization of inner resources. For example, consider a person having an intellectual critical day. His system is stimulated in some way that calls for a physical response. However, because of the intellectual critical day he may perceive the stimulus incorrectly or may respond incorrectly to what may have been a routine physical action, such as climbing a staircase. The result could be a turned ankle. Although his physical cycle was in the normal range

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[2]George S. Thommen, Is This Your Day? (new rev. ed.; New York: Avon Books, 1973), p. 61.

and adequate inner physical resources were available, he was unable to coordinate himself because of an intellectual miscue.

The largest degree of skepticism toward biorhythms derives from the lack of evidence to verify their existence. Critics have described biorhythm theory as everything from highly unlikely to a complete hoax. However, there is empirical evidence of other types of biological rhythms. Twenty-four hour circadian rhythms have been found in a variety of living organisms such as Bunning's[3] study of the sleep cycle in bean plants and DeCoursey's[4] activity cycle of flying squirrels. Harker[5] even succeeded in isolating the particular brain cells responsible for the nocturnal activity of cockroaches. There are also biological rhythms in humans as evidenced by the monthly menstrual cycle in women or the daily temperature fluctuations common to everyone.

In light of the evidence relating to the existence of biological rhythms, it is feasible that other rhythms could exist and thereby influence behavior in some fashion. Should biorhythms in fact exist, their influence on behavior would be evident in situations where behavior is elicited primarily due to inner stimuli rather than external factors.

The decision-making process would serve as an example of behavior within the biorhythmic sphere of influence. Decision-making occurs when a response is selected from a choice of responses which are available alternatives in a conflict situation. The selected response is the direct result of internal influences. External stimuli have only

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[3]Ritchie R. Ward, The Living Clocks (New York: Alfred A. Knopf, 1971), p. 145.

[4]Ibid., p. 201.

[5]Ibid., p. 229.

a secondary function and are merely contributory to the establishment of parameters within which the response will occur. For example, should physical force be the predominant factor in determining the response, the response would not be a decision since the element of choice has been removed.

Biorhythm theory claims that the biorhythmic cycles regulate the levels of energy available for utilization of inner resources. Therefore, biorhythms would influence decision-making by controlling the levels of the inner resources available for selection of a response.

The Problem

Absence without leave, AWOL, is a serious violation of military law and carries severe consequences. The military is very strict with the imposition of punishment for the offense of AWOL. The reason for leaving, or the fact it was a first offense, serves only to mitigate the severity of punishment; it does not excuse the act. Military authorities hold the philosophy that there is always a more appropriate alternative to AWOL.

The soldier is aware, before leaving, that some type of punishment is certain for such behavior. On the other hand, he cannot be certain that he will receive sufficient gain to outweigh an uncertain level of consequence. This doubt increases the stress already present from the conflict situation. Further amplification of stress occurs if the soldier is in his first term of military service and lacks experience with military ways.

It is not safe to assume all soldiers who go AWOL are facing such a demanding personal crisis that caution is abandoned; nor can it

be assumed that all these soldiers suffer from personality dysfunctions and disregard or rebel at the threat of disciplinary action. While inaptitude could be a factor, soldiers of all levels of intelligence and education go AWOL. With respect to maturity, chronological age cannot be used as a discriminating factor. What then is the common denominator, if any, that causes these soldiers to take such risk?

Biorhythmic critical days are days in which inner resources are most unstable with respect to functional utilization. Considering a degree of stress is present because of a conflict situation and stress itself is a drain on our inner resources, it is conceivable that on these critical days a person is most likely to respond inappropriately to a conflict situation.

Statement of the Problem

Is there a significant relationship between biorhythmic critical days and the decision by first-term Army enlistees to commit the offense of absence without leave while stationed in the continental United States during the Vietnam era?

Statement of the Hypothesis

There is no significant relationship between biorhythmic critical days and the decision by first-term Army enlistees to commit the offense of absence without leave while stationed in the continental United States during the Vietnam era.

Assumptions of the Study

This study was designed to determine if biorhythmic critical days influenced the decision to go AWOL by Army enlistees. Certain

basic assumptions are necessary for data treatment and analysis before any purposeful conclusions may be drawn from the results of the study.

It must be assumed that the sample is a true representation of the target population of Army enlistees who went AWOL during their first enlistment. The sample for study was selected from the decisional documents of military discharge review cases of ex-Army personnel who were discharged with other than fully honorable discharges. In many cases AWOL was the sole basis for the type of discharge received.

A decisional document is a partial military record and does not contain complete background information about the sample subject. The omission of place of birth makes it necessary to assume the subject was born within the same international time zone as the continental United States. This is necessitated because the biorhythms are calculated from the date of birth.

The assumption that all the data collected from the military documents are factual and accurate is a relatively safe one. These military documents yield data that have been checked and rechecked by virtue of the discharge review process.

The circumstances that a choice was available is implicit to this study. The fact that punishment of some form was imposed on the soldier after his return makes this assumption possible. The severity of punishment is not significant because there are many factors, not necessarily related to the AWOL, which must be considered when analyzing the situation. If no alternative whatsoever existed, no AWOL would have been charged against the soldier. The rationale that some type of punishment was imposed also serves as the basis for the assumption that the act of AWOL was an inappropriate behavior.

Purpose of the Study

The purpose of this study was to determine if there is a significant relationship between biorhythmic critical days and the decision-making process. The method employed was an ex-post facto type of descriptive research. The advantage of this method is the ability to observe a particular behavior which has occurred in its natural environment and investigate the possible causes for the behavior. In this instance, a particular potential cause was examined for its influential value on the selected behavior.

A sample group was selected from the military records of Army enlistees who went AWOL at some time during their first enlistment. The sample data have been statistically treated and analyzed to investigate if biorhythmic critical days have had any influence upon the soldiers' decision to go AWOL.

Significance of the Study

Biorhythm theory evolved nearly a century ago through independent research and observation by some of the most reputable practitioners of the period. However, the theory slipped into obscurity in the wake of the Freudian revolution. Its popularity has dramatically increased amongst laymen during the last twenty years, but has still not stimulated the interest of professional psychologists.

While studies undertaken on biorhythms have resulted in some interesting statistical data, no conclusive evidence to confirm or deny the theory has been found. The majority of biorhythm research has dealt with accidents that involve machinery such as aircraft, automobiles, or production-line equipment. This limited scope of research could be

responsible for the inconclusive results and for the apathetic attitude of psychologists and other professionals toward biorhythm theory.

This study is not designed to yield the final judgement on biorhythms. Its main intent is to widen the scope of research in this area by applying biorhythmic concepts to a behavior which is solely the result of the interaction of forces within the self. It is hoped that this expanded application will stimulate further interest and research in biorhythm theory.

Definitions of Terms

Absence Without Leave

Absence without proper authority from the proper appointed place of duty, or from Unit, Organization, or other place of duty at which one is required to be at the time prescribed.[6]

Rhythm

A sequence of events that repeat themselves through time in the same order and at the same interval.[7]

Biological Rhythm

Any rhythmic phenomenon which is manifested by and/or characteristic of a living organism.

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[6]Hq., Dept. of the Army, Army Reg. 310-25, Dictionary of U.S. Army Terms (Washington: Government Printing Office, 1972), p. 5.

[7]John D. Palmer, An Introduction to Biological Rhythms (New York: Academic Press, 1976), p. 6.

Biorhythm

A biological rhythm characterized by a fixed immutable period, hypothesized to influence human behavior through storage and dissipation of energy during alternate half cycles.

Critical Days

The first day of a new biorhythm cycle and the day when the rhythm changes from its high or discharge phase into the recuperating phase.[8]

Vietnam Era

August 5, 1964 through May 7, 1975.[9] During this period United States military forces participated in an armed conflict in South Vietnam .

Limitations of the Study

The resource material for sample selection partially limits the conclusions which may be drawn from this study. Separation with other than a fully honorable discharge may happen to any soldier for a variety of reasons, but there have been allegations of disproportionate treatment toward racial minorities. This factor could be significant in cases where the alternative to AWOL was nonexistent or was totally inappropriate and the minority soldier was punished whereas a white soldier

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[8]George S. Thommen, Is This Your Day? (new rev. ed.; New York: Avon Books, 1973), p. 61.

[9]Veterans Administration, Dept. of Veterans Benefits, Handbook For Veterans Benefits Counselors (rev. ed.; Washington: Government Printing Office, 1978), p. II-1-3.

would not have been charged with AWOL. The resource material did not yield racial data, therefore distinctions by race were not possible.

Further limitations are created by the inability to control certain potentially influential variables. Socio-economic background, maturity, personality type, and value system typify these factors. These variables contribute to the individual differences expected for normally distributed populations and is a desirable effect when conducting this type of study. However, their cause-effect potential on the observed behavior must be considered.

Education and aptitude are variables for which no control was attempted. Although these data were available, it is not considered reliable information. With reference to education, many soldiers left high school prior to graduation and it is not safe to assume that all eleventh grade educations would be similar in such cases. Aptitude tests are administered to each applicant prior to enlistment, but the validity of these tests is highly questionable. This is particularly true when tests are repeated or answers are supplied to the applicant.

It should also be noted that the only common factor concerning the AWOL is the commission of the act itself. The reason for leaving, length of absence, and reason for returning remain as individual differences and are not categorized in this study.

Chapter 2

REVIEW OF RELATED LITERATURE

This chapter is devoted to the review of literature related to biorhythm theory. Virtually every science from anthropology through zoology is affected by rhythmic phenomena of some sort. Due to this vast expanse, the material discussed is restricted to those rhythms manifested by living organisms.

There are three major subdivisions comprising this review. The first briefly explains the parameters in which all rhythms are viewed and the methods of classification. The second division elaborates on biorhythm theory directly. Covered is their initial discovery as well as theoretical claims and derivations made by proponents. The final subdivision contains a critical evaluation of research to date including a discussion of some special problems encountered in biorhythm research.

Fundamentals of Rhythms

Behavior, whether comprised of singular or multiple events, is determined to be rhythmic when it manifests a repetitive pattern while maintaining a constant sequence and time interval. Rhythms are viewed within the parameters of period (length), amplitude (range), frequency (speed), and phase (position). The significance of the individual parameter is variable, dependent upon the function of the rhythm and/or the field of study.

The period of a rhythm is the time interval required to complete the entire event or sequence of events characterizing that rhythm. The frequency is how often the rhythm occurs over a specified time interval. The time parameters, period and frequency, are inversely related. That is, a rhythm with frequency of 60 cycles per minute has a period of 1/60th of a minute or 1 second.

Amplitude indicates the high and low extremes of a rhythm. It may be referred to as the intensity, peak, or altitude. Basically, it measures the degree of change above or below the start point of a rhythm.

Consideration of phase may be performed in either of two ways. The first method refers to where the rhythm is located on its path at any given moment using terms such as halfway, ascending, etc.. It yields information as to the state of the organism at the specified moment or at least the expected state assuming the rhythm is uninterrupted or undistorted. The other method involves the interaction of different phases of different rhythms, hence the term phase-relationship. Should two or more rhythms reach maximum amplitude simultaneously, they are said to be in phase. When rhythms are out of phase the rhythm reaching maximum first is said to lead the second, conversly, the second rhythm lags the first. The degree of lead or lag is computed trigometrically with the difference between cycles called the phase angle.

Classification of rhythms also varies by purpose and scientific endeavor. They are often described in terms of a parameter such a high-frequency or monthly rhythms. Other commonly used labels are derived

from the rhythm's specific function, such as the menstrual cycle, or the system associated with the rhythm as in respiratory.

Linearity is a classification term that refers to the shape or path followed by a rhythm. It also signifies the algebraic equation necessary for mathematical analysis of rhythms. A linear rhythm, as opposed to non-linear, is distinguished by its smooth path in one direction and its opposite return thereby creating two equal and opposite half cycles. It is called a sine wave and is typified by the movement of a pendulum or tidal changes.

Non-linear rhythms follow unequal paths of various shapes. A sawtooth type waveform exhibits a slow steady movement until a peak is reached and then there is a sudden return similar to the thermostat of an electric heater. Other non-linear rhythms may follow a path resembling a sine wave, but the ascending phase may take twice as long as the descending phase.

The shape disparities between linear and non-linear rhythms create differences of greater significance than just visual ones plotted on a graph. Linear rhythms have the ability to increase their amplitude when driven at their natural frequencies. This is achieved through resonance, a basic principle of harmonics. Non-linear rhythms tend to synchronize with each other or may be modified by other outside periodicities acting as stimuli.[1]

Scientists working with biological rhythms do not acknowledge biorhythm theory, thus a distinction between biological rhythms and

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[1]Keith Oately and B. C. Goodwin, "Explanation and Investigation of Biological Rhythms", Biological Rhythms and Human Performance, ed., W. P. Colquhoun (London: Academic Press, 1971), pp. 1-4.

biorhythms is relevant with respect to classification. Halberg, a leading authority on biological rhythms, asserts the only common aspect is in the name.[2] Halberg is referring to the constant unalterable period basic to biorhythm theory. Biological rhythms rarely follow exactly the same period under all conditions. The prefix "circa" is used to indicate the variance around some fixed reference; circadian or about a day, circannual or about a year. However, the use of this prefix has been criticized for its ambiguity and misuse.[3]

There are classification similarities between the two types of rhythms other than the technical definition. Both are normally viewed and labeled in terms of their period. The phase serves as the secondary parameter and is commonly used to describe the rhythm's function. The major difference with the latter identifier is similar to the discrepancy with cycle periods. The biological rhythm experts define behavior during a particular phase in general terms whereas biorhythm proponents tread the dangerous waters of the specific.

Biorhythm Theory

Initial Hypotheses

Biorhythm theory has become a highly publicized and controversial topic on an international level. The founders of the theory were all professionals with varied scientific fields. However, the proponents do not have such scientific credentials and are more often

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[2]Bernard Gittelson, Biorhythm: A Personal Science (1980 ed.; New York: Warner Books, 1980), p. 125.

[3]Richard S. Wurtman, "Ambiguities in the Use of the Term Circadian," Science, April 7, 1967, p. 104.

merely laymen. The most referred to source on the theory is a book by Thommen, a Swiss businessman.[4] While not a founder of the theory, Thommen is its leading proponent. It is through his research and consultations with the founder's that most of the theoretical applications are based. Because none of the non-English original resources have been translated and most of the texts in English basically echo Thommen, the information contained in this subsection is extracted from his book unless otherwise cited.

As with other biological rhythms, the initial concept that some type of periodicity was correlated with man's behavior has existed since the ancient Greek philosophers. However, not until the late nineteenth and early twentieth centuries had sufficient data been accumulated to formulate any hypotheses about such periodic behavior.

Two European researchers independently proposed the existence of rhythmic patterns relative to certain behavior observed in their respective clinical settings. Both published their findings in close proximity, but with slight differences about the nature of these cycles. The major similarity was the hypothesis for the existence of two rhythms, one of twenty-three day duration and one of twenty-eight days, which significantly influence man's behavior.

Swoboda was the first to formally publish biorhythm theory. As a psychologist, Swoboda's central interest was behavorial complexities, regularities, and means by which behavior might be predicted. His curiosity had been aroused by a discussion of rhythmic changes in emotional states presented by Herbart's, Freisterigende Vorstellungen

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[4]George S. Thommen, Is This Your Day? (new rev. ed.; New York: Avon Books, 1973), pp. 1-21.

(Textbook on Psychology). Although Herbart offered no hypothesis to explain these changes, they were similar to observations Swoboda himself made on dispositional changes in his patients. Fliess, co-founder of biorhythm theory, contributed to Swoboda's conceptualizing with a similar report on rhythmicity, as did Beard's paper on the gestation span and birth cycles.

Now stimulated, Swoboda commenced his search to determine if man's feelings and actions were actually influenced by some detectable periodicity, and if so, whether these rhythms could be precalculated. His early research showed a periodic recurrence in fevers, the outbreak of illness, cancer development, and tissue swelling. While studying dream phenomena, he noted the appearance of twenty-three and twenty-eight day rhythms in his patients' descriptions of recurring melodies and ideas [obsessions?].

Further data were accumulated by recording births of infants among his patients. He found young mothers would have certain days in which anxiety concerning their baby's health would maximize and this often coincided with the infant refusing nourishment. Also, the infant's rate of absorption and digestion slowed on these days. From these observations plus suspicions already aroused from data pertaining to asthma and heart attacks, the critical day concept was formulated.

Swoboda wrote several books about his theory. In his most comprehensive work, Das Siebenjahr (The Year of Seven), he presented a complete mathematical analysis of his hypothesized rhythms demonstrating the repetition of births through generations. He contended most of life's major events follow this rhythmicity, and that these rhythms were both innate and inherited characteristics. Unfortunately he was

unsuccessful in his efforts to prove conclusively the existence of biorhythms, nor was he able to offer an accurate explanation of these rhythms beyond the initial observation of duration.[5]

Fliess approached rhythmic phenomena from a different perspective. Fliess was a nose and throat specialist practicing in Berlin. A controversial paper on bisexuality had already brought him a degree of notoriety. Later, in 1910, he was elected as President to Germanic Academy of Sciences.

Technically, Fliess was slightly ahead of Swoboda since it was Fliess who suggested the two cycles in an earlier paper which was influential and supportive to Swoboda, yet his first text on the subject lagged Swoboda by two years. His intent was to stimulate interest in his theory, but the complexities of his mathematical analysis were not well received and only a few people took interest. Further opposition resulted from his insistence that physical and emotional changes were due to the interaction of hereditary and environmental conditions. Elements of this issue are still contested today.

Fliess' interest in rhythms evolved from clinical observations, as did Swoboda's. Fliess was curious as to why some children exposed to contagious disease would remain immune for days while others succumb quickly. He observed a seemingly rhythmic pattern with fevers, recurrent illness, and deaths among his patients. By tracing these patterns back to birth he derived the same rhythms as Swoboda.

The sexual stereotypes of the era, in conjunction with his belief that all individuals inherit characteristics of both sexes, led

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[5]Bernard Gittleson, Biorhythm: A Personal Science (1980 ed.; New York: Warner Books, 1980), pp. 41-47.

him to classify the rhythms in terms of sex. Since men historically were associated with physical attributes and many of his observations of the twenty-three day rhythm involved physical symtomology, he called this rhythm masculine. The feminine classification evolved from the close proximity of the twenty-eight day rhythm to the menstrual cycle and his observations of emotions, a feminine stereotype. These have since been labeled the physical and emotional rhythms without the sexual denotations.

The third component of the biorhythmic triad was found more by accident. Dr. Alfred Teltscher was a professor of Engineering at the University of Innsbruck. He was interested in why his students' intellectual abilities would vary over the course of a semester. In searching for an answer, he uncovered a thirty-three day rhythm.

There is little written about Teltscher's work. Thommen points out even his sources on Teltscher were of a secondary nature. Tatai reported a "Friedrick" Teltscher, at Innsbruck, had used five-thousand college and high-school students as subjects in an experiment with the same result, but failed to cite a reference in the text and no work of Teltscher's was listed in bibliography.[6] In any event, this thirty-three day rhythm was coined the intellectual rhythm since it revealed high and low peaks in the subject's ability to absorb material and overall mental performance.

Shortly after Teltscher's discovery, similar results were found in a group of railroad shop workers who were studied by Hersey of Pennsylvania University. Hersey had undertaken a lengthy and

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[6]Kichinosuke Tatai, Biorhythm for Health Design (Tokyo: Japan Publications, Inc., 1977), p. 17.

comprehensive survey of emotions displayed by industrial workers at work and home. His original sample consisted of 17 shop workers in various capacities from untrained helpers to foremen. Workers were interviewed four times daily and twice on Saturday half-days for over a year regarding their moods. A thirteen level rating scale with a range from happy to worried was devised to assign a numerical score for each interview. All inferences were based upon the tabulated scores of each worker and the group averages with no specific hypothesis.[7]

Early observations showed an unexplainable periodic fluctuation of about four and one-half to five and one-half weeks reflecting the high and low levels of mood changes related by the workers. Hersey increased his sample size to a total of 29 subjects. The latter additions included more diversified vocations such as teachers, insurance salesmen, and Hersey himself. The final results showed these same unaccountable fluctuations for all subjects.[8]

Hersey offered no definitive explanation for his findings. He stressed that this cyclic phenomena does not mean periods of elation and depression will occur according to a predetermined schedule. The degree of change is dependent upon the internal and external conditions of the moment. He emphasizes:

> There will be a lowering <u>of a persons emotional resistance and his capacity for integration and response which may for any definite "low" merely mean that he is less happy than during the "highs" both preceding and following</u> [italic's in original].[9]

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[7] Rexford Hersey, <u>Workers Emotions in Shop and Home</u> (Philadelphia: University of Pennsylvania Press, 1932), pp. 338-342.

[8] Ibid.

[9] Ibid.

Other important points made by Hersey are absent from biorhythm literature. Of particular relevance was that the rhythms, while displayed unanimously amongst subjects, varied between individuals and did not indicate absolute periodicity. Further, the regularity may vary within the individual, but this variance is never more than one week regardless of the particular circumstances. These comments concerning variations in the rhythms, both within and between individuals, are a direct contradiction of the fixed rhythm theory presented by the proponents.[10]

As a result of his study with Pennsylvania Railroad workers, Hersey was invited to Germany to replicate his study. He accepted and had the same results, but was still puzzled by the rhythmic phenomena. Upon his return he collaborated with Bennett, an Endocrinologist from Doctors Hospital in Philadelphia. They studied a group of 250 subjects, mostly male, then followed with another sample of 1,000, mostly female. Not only were the results the same, but variations were noted in thyroid and pituitary gland outputs as well as fluctuations in blood cholesterol and red blood corpuscle levels.[11]

Based upon the latter findings, Hersey was able to narrow the rhythm's period to between thirty-three and thirty-six days, adding that about 60% of those living in the northeastern United States have thirty-three day rhythms. He elaborated that the rhythms lengthen with age, citing his own rhythm's three day change over a ten year span. Bennett and Hersey attributed the cycles to thyroid gland activity. They

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[10]Ibid.

[11]Myron M. Sterns, "Do You Know Your Emotional Cycle? Redbook, November, 1945, pp. 58, 72-74.

postulated that individuals with overactive thyroids could have cycles as short as three weeks where underactive thyroids could lengthen cycles.[12]

Theoretical Claims and Derivations

Biorhythm proponents have stretched the original hypothesis a long way. The theory presented to the public more closely resembles an exercise in advertising and promotion rather than a series of scientific postulates based upon clinical observation and empirical evidence. Many of the authors have biorhythm related products for sale in addition to their books. Others appear to have no knowledge of what they are dealing with and merely paraphrase their predecesors. Sometimes concepts are logically presented, other times the claims are absurd. While the naive are part of the target population, the books are primarily aimed at those who are generally educated, but lack specialization.

The critical day concept of Swoboda is the central theme presented by proponents. The general contention is cycles are divided in two halves or phases. The first half is the positive phase where energy output is at optimum levels and is discharging. The second half is the negative phase where energy has been dissipated and is recharging. Of primary importance is the point of crossover occurring the first day of each phase. During those days the person is allegedly unstable with respect to energy levels controlling behavior attributed to the respective cycle. Since the simplest behavior involves a complex of physical, emotional, and intellectual operations to some degree, a critical day of one cycle may affect behavior normally attributed to a different

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[12]Ibid.

cycle. It is asserted that a person's susceptibility to errors and/or erratic behavior is maximized on critical days. This concept is the more logical of the claims and the most often researched.

Further claims are made pertaining to the influence of rhythmic highs and lows on performance. The obvious implication being that on positive phases performance is better and on negative phases it is poorer. Leading proponents point out some people will not necessarily fit this correlation. This may appear a tactic by promoters to defend against the weakness of the claim, but it does make sense. Any schoolteacher can attest that a hyperactive student on an energetic day is impossible to deal with, but can be readily approached during more passive periods. This does not imply these changes will occur according to any set rhythmic pattern, but as Hersey tried to make clear, the optimums and minimums must be considered in the context of the individual and external conditions.

Phase relationships is another area explored by biorhythm proponents. A great deal of latitude is available here due to the numerous potential combinations afforded by the three lengthy cycles and the escape route of individual differences. Testing the validity of these claims would involve a sample size of unfeasible magnitude since not only would relationships showing a significant frequency have to be analyzed, but also those showing no occurrences must be considered.

One common mode of presentation for phase relationships is to generalize an extreme example of behavior to the particular cycle combination under which it occurred. Such a generalization is related by Tatai as told to him by a German doctor, " . . . when the physical cycle is in its most positive phase and the sensitivity cycle and intellectual

cycle are negative, a person can be capable of great violence."[13] Another method is to retrospectively explain an event in the life of a celebrity or public figure in terms of biorhythms. Usually this involves some great accomplishment, failure, or their death.

More specific usage of phase relationships pertains to compatibility. Thommen cites the work of Gross, another untranslated resource, whose studies with biorhythms have discovered several insights with interpersonal relationships. Two people with the same birth date are ideal partners, biorhythmically speaking, with those whose cycles are farther apart being less compatible. The method for determining compatibility is to assign percentages reflecting the distance of cycle days from start, sum the three cycles, divide by three, and compare the composite with the composite of a spouse, lover, business partner, etc..[14]

A deviation of the composite rhythm is presented by O'Neil and Phillips. They suggest a single composite rhythm rather than three separate cycles. A self-administered ten question test was designed to assess if one's personality is biased by physical, emotional, or intellectual attributes. This enables the composite to be adjusted with respect to the particular bias.[15]

More recently, Gale adopted the composite idea. However, he goes much further by hypothesizing a fourth rhythm. This new rhythm has

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[13]Kichinosuke Tatai, Biorhythm for Health Design (Tokyo: Japan Publications, Inc., 1977), p. 93.

[14]George S. Thommen, Is This Your Day? (new rev. ed.; New York: Avon Books, 1973), p. 140-141.

[15]Barbara O'Neil and Richard Phillips, Biorhythms: How to Live With Your Life Cycles (Pasadena: Ward Ritchie Press, 1975), pp. 69-81.

a period of thirty-eight days and is called the intuitional cycle. He describes this in terms of unconscious inner perceptions or "hunches". Gale drastically alters biorhythm format by arranging the four rhythms into opposing pairs; intuitional vs. physical, emotional vs. mental (intellectual). This action is attributed to Jungian views of psychology. No statistical or observational basis is offered to justify the new rhythm, nor are any presented which have tested it. He simply states, "I chose [it] for a variety of mathematical and intuitive reasons. Also, it seems to work!".[16]

Although no research has been attempted on either Gale's concepts or those of O'Neil and Phillips, their books offer not only imagination, if without validity, but the only alternative suggestions pertaining to biorhythm theory. This is possibly an important point when one considers the original theory as a working hypothesis in a search to understand periodicity observed in man.

The use of biorhythms as a predictive device is the most extreme application and is the most frequently criticized. Most proponents do not directly state biorhythms can predict, but do "suggest" a high success rate of prediction with birth dates, sex determination, and sports events. However, some proponents go well beyond implying predictive abilities of biorhythms while simultaneously stating they do not. One blatant example is Mallardi. In the introduction to his second book he clearly explains, "The outcome of sporting events may be predicted, sometimes even to the exact score [italics in original]."

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[16]Mort Gale, Biorhythm Compatibility (New York: Warner Books, 1978), p. 22-24.

He mentions there is no guarantee because there are other factors to consider, but adds that all new "prediction devices" are controversial.[17]

Other claims relate biorhythms to crime, suicide, mental illness, and death. Also, an additional critical day situation arises when two cycles intersect without regard to phase. There is even a lethal behavior test offered by Tatai to illustrate one's propensity for violence.[18]

Biorhythm theory appears to have two distinct levels, the original concepts and the commercial claims. Perhaps Gatty sums it all best:

> The advertisers will suggest that one can predict the outcome of a football game, the deaths of movie stars, home runs in baseball, and will even claim to explain the disaster of Custer's last stand against the Indians.[19]

While perhaps an exaggeration, Gatty more than adequately expresses why biorhythm theory is viewed with such disdain despite the fact it is merely a series of working hypotheses attempting to explain observed periodic behavior.

Biorhythm Research

Researchers have accomplished little toward the resolution of the biorhythm controversy. There is a comparatively small quantity of research considering how long the theory has existed. The number is

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[17]Vincent Mallardi, Biocycles (New York: Dell Publishing Co., Inc., 1978), pp. 11-12.

[18]Tatai, op. cit., pp. 96-99.

[19]Ronald Gatty, The Body Clock Diet (New York: Simon & Schuster, 1978), p. 22.

further reduced by studies which are untranslated or simply outdated and unacceptable under modern scientific standards. More recent studies often reflect researcher bias or contain errors in theoretical application. However, these latter problems result, at least in part, from the inconsistent presentation of the theory by its proponents.

Biorhythm theory, although simplistic, is more difficult to research than would be expected. The cycle lengths demand large study samples and periods of observation which are normally impractical for experimental or laboratory research. Establishing controls is also difficult because the theory incorporates individual differences and is intermittent with experimental (observable) effects. With ex post facto studies, the problem is in locating a reliable data source. Even when a researcher finds such data it is not likely to contain exact birth times as well as incident times.

To date, the research on biorhythm theory yields little to draw conclusions from. Proponents cite many studies with convincing numbers, but presentations are only in the briefest form. Of course this is expected considering the authors are not scientists nor are their books aimed at the scientific community. On the other hand, many researchers reject the theory sight unseen or perform hastily constructed studies with undefined terms to refute the theory. There are also some objective studies which had mixed results, but still nothing conclusive for either side.

The main concentration of research has been in the area of accidents. The advantages of accident studies are their ability to isolate situations where operator error was the chief causal factor and their accessibility to incident times with reasonable reliability. Also, the

control problem is overcome since the accident serves as the experimental effect and individual differences become a desirable study characteristic. However, there are disadvantages to be considered as well.

Reliable data are the most obvious problem with accident research. Older studies rely on less comprehensive records than are maintained today, but modern records are not always truthful accounts despite details. This is typified by insurance reports of industrial accidents where lost-time and workman's compensation are factors. Then there is the difficulty of subjectively determining what constitutes operator error and which of these errors are suitable for biorhythm analysis. To illustrate, consider a car accident involving a drunken driver. This is not an appropriate test of biorhythm theory since a person may become intoxicated at any time and when intoxicated is highly susceptible to accidents regardless of biorhythmic status. Further, the drunken driver may not have been at fault, but his condition creates an undefensible position in court and therefore he is guilty on insurance reports. Accident studies seldom clearly define and/or categorize the circumstances. This point is a major source of conflict as to what has or has not been proven by the study.

Experience is another potential complication in accident analysis. It is normally left undifferentiated in biorhythm studies and depending upon the nature of accident involved, this factor increases in significance. In the case of automotive accidents, argument can be made as to whether the older, more experienced driver is superior to the young driver with sharper reflexes. However, experience with industrial machinery creates a large differential between the apprentice and

journeyman operator, not to mention the qualitative difference between amateur flyers versus career pilots.

While virtually all studies of biorhythm/accident relationships are vulnerable in one or more of these areas, the Wolcott[20] study of civil aviation accidents typifies most of them. This study is one of the most professionally presented and comprehensive studies of biorhythms to date. It examined 4,008 civil aviation accidents occurring in 1972 from the records of the National Transportation Safety Board and determined 3,253 (81%) of these to be pilot involved.[21] Biorhythms for the pilots were computed using the exact incident time and noon as an arbitrary birth time. Separate analyses were performed for not only a twenty-four hour critical period, but also a forty-eight hour period, single cycle negative phases, and multiple cycle negative phase combinations. Chi square statistical methods for frequency data were applied with a .10 alpha level of significance. Also included was a table summarizing the major accident studies preceeding the Wolcott study with an objective evaluation.

Significance was found for the intellectual cycle critical days as well as the double critical days involving the physical/intellectual combination. However, these findings were rejected on the basis that the significance would have to had been at a higher level and involve more than two of the seven cycle combinations. On the surface this

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[20]John H. Wolcott, et. al., "Correlation of General Aviation Accidents with Biorhythm Theory," Human Factors, 19, No. 3 (1977), pp. 283-293.

[21]The term pilot involved was not defined and it is unclear if this means exclusively pilot error or some combination of circumstances which included the pilot.

study appears to resolve the controversy by convincingly disproving biorhythm claims, but closer inspection raises serious doubts as to the validity of the study.

The first question arises from the number of civil air accidents occurring in a single year. To obtain such a high number the study must have included even the most minor of accidents and those involving both amateur and student pilots. These were undefined factors and no adjustment was made as to the increased likelihood of accidents caused by amateurs versus commercial pilots. The actual significance of such distinctions is incalculable, but certainly it is questionable that commercial pilot error would be responsible for 81% of commercial accidents. The results are further complicated by use of the term pilot "involved" rather than pilot "error" which raises questions about the subjective determination of fault in the first place.

Data source and theoretical application are also areas for inquiry in the Wolcott study. Where the National Transportation Safety Board records can be considered a thorough and reliable data source for major air accidents, this is not the case for minor private incidents. This fact is particularly evident when the investigative manpower is contrasted with the number of accidents occurring in a single year and the time involved to conduct a comprehensive accident analysis. With regard to theoretical application, Wolcott erroneously computed the critical day period as twelve hours above and below the phase crossover whereas the theory states this period is the twenty-four hours following the moment of phase change.

One final point of contention evolves from the use of noon as an arbitrary birth time. Although necessitated by the lack of data, this

should have been an emphasized consideration, but was actually dismissed on the basis that others had done it before. In the final analysis, a study which appears to offer convincing evidence toward resolution of the controversy in reality proves nothing.

Human performance is another popular area of exploration for biorhythm researchers. As with accident research, little has been resolved. However, several studies have yielded mixed findings and have less definitive conclusions. The scope of performance research usually involves sports, intelligence, or reflex testing.

Problems encountered with performance studies parallel those found in accident research with one notable exception. With accidents, it is desirable to utilize the professional operator since the inexperience factor is reduced. In performance studies the opposite is true because day to day variance is smaller among professionals and minor changes often make disproportionate differences which may or may not be significant. Also, the term amateur has a different connotation as in sports where it merely refers to economic reward rather than level of performance.

The varsity gymnast offers a clear demonstration of how deceptive a subject's performance can be. Varsity athletes, although considered amateurs, are frequently world record holders and therefore cannot be analyzed in the same context as amateur drivers or pilots. If a researcher attempts to apply the critical day hypothesis to such a subject, the expectation would be erratic behavior toward either extreme on biorhythmic critical days. Should a gymnast make a single slip during competition, the score assessed may drop significantly and conversely rise for errorless performances. However, in competition

performers attempt highly difficult movements and often have alternative formats of maximum difficulty to use in case of earlier slips or just to catch up to a leader. While an error-prone or errorless performance may be a true indicator of performance, it is conceivable that both a careless slip and a highly difficult errorless movement could occur in the same performance. Therefore the resultant score would be routine and the hypothesis would be rejected for a performance which would actually typify the theory. Of course the converse could occur when minor variations create above or below normal placement in the competition. These effects do not even consider the subjective methods of scoring by competition judges.

Many of these obstacles were overcome by Ojanlatva in a study of record setting performances in track and swimming events.[22] The study was comprised of 209 subjects selected from five universities who had established official competition records in their respective events. Only the positive phases of biorhythm cycles were tested and no significant relationships were found. The importance of this study lies with its successful design in that the records were set against some objective criterion such as time or distance and the isolation of only peak individual performance. The major weakness is the single measurement does not afford the opportunity to examine if the record setting performance was a significant change from the subject's normal competition performance. Often a superior athlete establishes a record and

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[22]Ansa Terttu Tellervo Ojanlatva, "The Relationship Between Record Setting Athletic Performance and Biorhythms," Dissertation Abstracts International, 38, No. 10-A (1978), 5936 (PH.D. Southern Illinois University at Carbondale).

continues to better his own record several times, but only by fractional differences.

Intelligence testing is particularly difficult since there is no test which yields the same score consistently for the same subject every time. Only the general range of intelligence is considered safe for experimental purposes and it would be highly unusual for a subject to indicate a statistically significant difference in score under such circumstances. Also no intelligence test has considered biorhythms in the development of test norms, therefore it would be impossible to construct an adequate experimental design because the researcher would effectively be seeking a deviation in scores from norms that already have these deviations incorporated.

Taylor attempted a comprehensive study of the intellectual cycle hypothesis by using parallel forms of the Otis-Lennon Mental Ability Test on 507 high school students.[23] Subjects were selected according to various biorhythm positions with the second testing session scheduled eight days later to insure a positional change.[24] The final sample was 367 students completing both forms and comparisons were made for biophase, test form, and sex. Taylor found no significant relationships, but made several recommendations including lengthening the study period.

When examining biorhythm research, several irregular characteristics emerge. In addition to careless theoretical application and

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[23]Thomas Charles Taylor, "A Study of the Relationship of the Intelligence Biorhythm and High School Students' Mental Ability Test Scores," Dissertation Abstracts International, 38, No. 10-A (1978), 6028 (Ed.D. University of Kentucky).

[24]The use of eight days did not necessarily guarantee positional change for the intellectual cycle which has a peak-to-peak span of sixteen and one-half days.

researcher bias, there are often conclusions beyond the study design and the absence of conclusions for significant findings which are deemed inconsistent with the theory. A study of both varsity athletes and general physical education students' performance was conducted by Donnelly.[25] Three statistically significant relationships were found, but only the one consistent with biorhythm theory was discussed. Berube examined Teltscher's rhythms using 51 students and found no relationships between the cycle and scores on hygiene exams.[26] While appropriately concluding biorhythms lack predictive value with hygiene scores, he goes on to deny any predictive validity for all human behavior and states that the theory has no rational basis.

Another uncommon occurrence is the explaining away of significant findings. A study of biorhythms and perceived emotional states was performed by Burstein.[27] Members of five families, ten adults and eleven minors, were given self-rating sheets concerning their emotional state and quality of family interaction on a daily basis for five months. Additional special events such as accidents, illness, or dreams were also recorded. Significant relationships were found for the adults perceived emotional states on both physical and emotional cycle critical days as well as reported accidents. Burstein's overall conclusion was

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[25]Joseph Edward Donnelly, "Relationship Between Biorhythms and Human Performance," Dissertation Abstracts International, 38, No. 8-A (1978), 4655 (Ed.D. West Virginia University).

[26]Barry Peter Berube, "Absence of Correlation Between Measured Performance in College Students and Biorhythm Information Calculated From Their Individual Birthdates," Dissertation Abstracts International, 38, No. 3-A (1977), 1337 (Ed.D. George Washington University).

[27]Gary Burstein, "The Relationships Between Biorhythms and Perceived Emotional States," Dissertation Abstracts International, 36, No. 11-B (1976), 5781 (California School of Professional Psychology).

that the physical and emotional rhythms significantly affect perceived emotional states. However, he developed an arousal theory to explain how the subjects responded in an aroused state because of knowledge of biorhythm position. The implication being that the subjects expected unusual emotions on critical days and therefore perceived them. This may be correct if the subject accepted biorhythm theory, but what about those whose attitude toward biorhythm is more cynical? In those cases the arousal theory would display a reverse effect and no significance would have been detected.

In summary, biorhythm research has a long road ahead. Difficulties with research design, data collection, and bias must be overcome before any fruitful results are to be found. There is a distinct need for clarification of theoretical application and for translated original resources. Much has been accomplished with biological rhythms and it is not totally unlikely that biorhythms may exist at some level of behavior. Whether or not such rhythms would serve any practical use for science will remain an unanswered question until this first bridge is crossed.

Chapter 3

METHODS AND PROCEDURES

This chapter contains a comprehensive description of the target population of this study and the methods of analysis utilized in making conclusions about this population. The main objectives are to permit the reader to assess the results of the study in their proper perspective and enhance efforts of other researchers to continue research on the subject matter.

Population and Sampling

The population of this study consists of persons who enlisted in the United States Army during the Vietnam era. The overwhelming majority of this population is male. Ages vary from seventeen to thirty years old with the largest proportion comprised of the younger groups. The potential years of birth span a period of twenty-five years from 1934 through 1958, with the bulk of the population born between 1946 and 1958. Most of the subjects were minimally affected by negative sociological factors such as the Depression Era or World War Two. As a whole, they were raised during a time of national prosperity.

Three years was the most frequent term of enlistment during the era and was the only term used for the sample selection. The enlistment was voluntary and effected for a variety of reasons too numerous and complex to categorize. A cross-section of virtually every socioeconomic

and cultural background is represented in this population with the mode at the lower socioeconomic levels.

The study population is considered to be in good physical condition because of enlistment requirements and the rigorous physical conditioning during basic training. Another characteristic is little or no serious problems with civilian authorities prior to enlistment. Applicants for enlistment must have no felony convictions as an adult. Even a felony conviction as a juvenile would require a moral waiver before being accepted into the Army.

Although these soldiers received other than fully honorable discharges, this is not considered a population fact since the rate of discharges upgraded at personal-appearance hearings before military discharge review boards is almost fifty percent. Also, the initial characterization of a discharge is a subjective decision made by commanders and there is no way of determining how many fully honorable discharges would have been characterized differently, or vice-versa, had the commander been different.

The sample data collected from this population have been statistically treated and the results analyzed. The conclusions of this study, inferences about the population, and any further generalizations to other populations were formulated from this analysis.

Materials and Instrumentation

The case documents used as the resource material for sample selection contained most of the data necessary to perform this study. The date of birth was used to calculate the subject's biorhythms. However, the exact hour of birth and time of departure were not available

in the documents. This problem was dealt with statistically and is discussed later in this chapter.

The type of enlistment and dates of service showed which era and term of service the AWOL occurred in. The date of AWOL, the type of punishment imposed, and the hearing summary provided the remaining data related to the offense.

All biorhythms were computed independently without the use of charts, tables, or a built-in calculator function. This was accomplished by finding the exact number of days the subject had lived up until the date the AWOL occurred. This number was then divided by the durations of each biorhythm cycle.

Design of the Study

The study was designed to investigate the relationship between biorhythm theory and decision-making. This relationship was observed by comparing the frequency of the decision to go AWOL with the biorhythmic cycles on the day the decision was made.

The sample selected in this study was limited to voluntary first-term Army enlisted personnel. The fact that the subjects voluntarily opted to enlist in the Army implies the subjects desired to be in the Army at least for a short period of time. This served to control the "forced to be there" factor as a reason for the AWOL. The use of only first-term enlistments aided in diminishing the possibility of familiarity with the military environment or experience as a factor. To further reduce the experience factor, the first offense of AWOL was the only occurrence studied. Even if the subject was familiar with the punishment to others for the act, he had not directly experienced the

impact of the punishment, nor could he be sure what would happen in his particular case.

The Vietnam era limitation served two functions. Primarily, it was the most racially balanced period in military history. Other periods have had minorities in military service, but the balance was seriously biased in contrast to the national population. The second reason for this era was to aid in the accuracy of the data obtained by the military records. In 1973, the Military Records Center suffered a massive fire where the records of many soldiers who served prior to Vietnam were destroyed. The records for those soldiers must be reconstructed from other sources which may not be accurate. Those records of Vietnam era soldiers are the original records of service.

One major factor of concern when dealing with the act of AWOL is the opportunity to go in the first place. Soldiers who want to go AWOL may not be able to for reasons such as geographical location, passports, transportation, or unfamiliarity with foreign customs. To insure opportunity, the sample was limited to soldiers stationed in the continental United States. Although Hawaii is geographically closer to California than is New York, a California-bound soldier may find it a good deal easier to hitch-hike three thousand miles than to get off an island.

The study was also limited to AWOL's which commenced on Tuesdays through Fridays and had a duration of three days or longer. Very frequently, AWOL's that are initiated during weekends are not discovered or reported until the following Monday morning, leaving doubt as to which day the soldier actually left. The three-day minimum was imposed to

insure that the soldier actually left and was not an instance of merely missing a day or two of work.

The final screening device employed was to only include incidents of AWOL where the subject was actually at his duty installation the day prior to leaving. As with the weekend exclusion, doubt would exist concerning when the decision to leave was made. AWOL that occurred the day after a holiday, following authorized leave, and other situations where the subject's whereabouts was in question were omitted from the sample.

Data Collection

The subjects were selected by assigning random numerals to the index system of decisional documents. The decisional documents from cases heard in 1978 were chosen as the group from which the sample was taken. This arbitrary choice was made because the documents were indexed by the year the case was processed by the review board. A list of 3,006 documents was obtained from a group of 4,716 cases. The documents were screened according to the predetermined selection criteria which left a working sample of 104 subjects. The subjects were placed into groups determined by biorhythmic critical days (CD) and non-critical days (NCD) for purposes of statistical treatment and analysis.

Data Analysis

Before any statistical analysis could be performed, it was necessary to compensate for the missing data of exact times of birth and

AWOL departure.[1] It would not have been appropriate to assume a single time of birth or to arbitrarily select a departure time. It was decided that each subject's biorhythms would be computed for a combination of birth and departure times, subsequently a mean value of these computations could be utilized for statistical analysis.

It was necessary to first determine the potential time span within which the subject could possibly have left. Soldiers usually have duty hours from 7 a.m. to 5 p.m., but there are other possibilities such as guard-duty or other shift-work. Using shifts as a guideline, the earliest a subject could have departed would be after 8 a.m. the day prior to the reported AWOL. Had he been working the midnight to 8 a.m. shift, theoretically he could leave sometime after work and his absence would not be reported until midnight when he failed to report for work. The time of AWOL would show the time he was not at work even though he left hours before. The latest time he could have left would be 11:59 p.m. of the reported date of AWOL. Thus, the span of potential departure times is 8 a.m. of the day prior through midnight of the reported date of AWOL; a range of forty hours.

It should be noted that going AWOL is not the same as breaking out of prison. The degree of freedom soldiers have to come and go removes the now or never element. There is usually an undeterminable time lapse between the decision to leave and the actual departure. The elimination of AWOL commencing on a weekend or holiday narrowed this time lapse to maximum of twenty-four hours, but a more specific focus

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[1]Studies performed on birth time frequencies did not resolve this problem. Findings indicated the highest frequencies to be near dawn and the lowest near dusk.

was not possible. Also, it was not a requirement of the study for the soldier to be on a critical day at the moment of departure, only being critical when making the decision was necessary to be consistent with the theory. For these reasons, the twenty-four hours preceeding the soldier's departure time was utilized for determination of the subject's biorhythm status.

Seven potential times were selected from the forty hour span of possible departure. The earliest time used was noon of the day prior to the reported AWOL with further selection based on six hour intervals ending at midnight the AWOL date. This method resulted with three measurements for the day prior (noon, 6 p.m., midnight) and four measures on the reported day of AWOL (6 a.m., noon, 6 p.m., midnight).

The twenty-four hour span for birth time was divided into four successive quarters of six hours each. The midpoints of each quarter (3 a.m., 9 a.m., 3 p.m., 9 p.m.) were used as the times of birth. In addition to dispersing the birth date evenly, this process compensated for any possible differential created by time zone changes where a subject was born in one zone and departed AWOL from another.

The hypothesis was tested four times, once for each of the three biorhythm cycles and once for the combined total. Subjects were classified as critical if any part of the twenty-four hours preceeding departure displayed one or more critical points. No analysis was performed for high and low cycle phases, nor were multiple critical days separately distinguished since their expected frequencies are so low they would have created analytic disproportions beyond the design of the statistical procedures employed.

Four data tables were constructed comprised of 28 measurements each. The measurements were determined by the number of subjects experiencing critical days during the seven departure times and four birth times. A mean value was calculated for each departure time by averaging the birth time measurements associated with the particular departure time. The resulting seven mean values were then independently analyzed using a one-way Chi Square[2] procedure comparing the expected frequencies for the population with the observed sample frequencies obtained from the data. The number of levels of the independent variable was two with an alpha level of .05.

The expected frequencies were also affected by the unavailability of exact times. Rather than the normal two critical days per cycle, the research design employed resulted with four possibilities because of the overlaps in estimated times. That is, the departure times used do not directly match the birth times thus for each twenty-four hour period measured there are four partial biorhythmic days. This in effect doubles the opportunity for critical days to appear within the parameters of the selected measurement. The expected frequencies were computed using the Laws of Chance.[3] For the individual cycles, the Proportionate Law was used and for the combined cycles analysis the Multiplication Law was applied.

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[2]Marigold Linton and Philip S. Gallo, Jr., The Practical Statistician: Simplified Handbook of Statistics (Belmont: Wadsworth, 1975), p. 68.

[3]Russell Langley, Practical Statistics Simply Explained (rev. ed.; New York: Dover, 1970), pp. 21-27.

Symbols used:

P = Physical Cycle

E = Emotional Cycle

I = Intellectual Cycle

CD = Critical Day(s)

NCD = Non-critical Day(s)

α = alpha level

N = Sample Size

fo = Observed Frequencies

fe = Expected Frequencies

T = Total

$\bar{X}$ = Mean

X^2 = Chi Square

df = Degrees of Freedom

b = Base Measurement

Chapter 4

ANALYSIS OF DATA

The thrust of this chapter is the transformation of raw data into meaningful sample facts. All of the data collected through the sampling techniques have been statistically treated and the results analyzed. There are two main components to this chapter, the first of which describes characteristics of the sample. These facts, when compared with those of the population, afford the opportunity to determine the degree of adequacy the sample serves as a population representative. Also included are sample facts which provide clues about the influence of intervening variables and the accuracy of assumptions made at the onset of the study. The second component is a presentation of the statistical manipulations employed in testing the null hypothesis. Tables have been added for purposes of convenience and clarity.

Response Analysis

A list of 3,006 discharge review case documents was obtained through tables of random numbers. Duplicate numbers reduced this list to 2,225 and an additional 272 documents were missing from the files. This left a total of 1,953 documents actually examined. Screening procedures such as weekend AWOL's and prior service eliminated all except the 104 cases which served as the working sample.

The age range for enlistment was 17 - 28 years old with a mean age of 19.3 years and a median of 18.4 years. Only ten subjects were

over 21 years old at enlistment. Birth years spanned a period of sixteen years from 1943 - 1958. The mode for year of birth was 1954 (15) and the median year was 1953. A five year span from 1952 - 1956 accounted for 62 (60%) of all births. All except two subjects were male.

The year of birth and age at enlistment statistics all approximate the expected population parameters. Thus, from the available information, it may be said that the sample is a true population representative. Although the number of female subjects was slightly lower than expected, the sample size was too small to consider this shortcoming as significant.

Wednesday was the most frequent day for the onset of AWOL with 31 (30%) departures. Close behind were Thursday and Friday with 29 (28%) and 27 (26%) respectively. Tuesday lagged somewhat with 17 (16%) subjects departing. This relatively balanced distribution suggests randomness of departure which is supportive of the spontaneity element in the decision-making process.

Although AWOL length was not a factor for special scrutinization in this study, there was an unexpected distribution that warrants notation. As expected, 69 (66%) subjects were gone less than thirty days with 43 (41%) of those under ten days. However, of the remaining 35 (34%) subjects whose AWOL was over thirty days, 20 (19%) were gone over ninety days (one subject's AWOL was over 3,000 days). This latter statistic was higher than anticipated considering the inexperience and first offense factors. For these lengthier AWOL's there is a possibility the reason for leaving was appropriate and no real choice involved. The imposed punishment could have been because the length of

absence negated the original reason for leaving. While explanations for the AWOL's were usually contained in the case document, any further analysis would have required secondary subjective determinations and therefore were not performed.

The initial six months of service accounted for 38 (37%) AWOL's and an additional 33 (32%) departed during the second six months for a first year total of 71 (68%) departures. The remaining 33 (32%) were evenly dispersed over the next two years. These numbers raise questions about the significance of the maturity and personality variables. It is feasible these variables contributed to cause with a greater impact than anticipated. However, they only signify the approximate time in service where AWOL is more likely to occur and do not alter the central study issue of exact day.

Statistical Analysis

This section contains data presented in both textual and tabular form for each of four analyses. Each component summarizes the expectations, observations, and effects upon the null hypothesis for the respective biorhythm cycle or combination of cycles.

Physical Cycle Analysis

The physical cycle has a period of twenty-three days and because of time adjustments there were four opportunities for critical days. The expected frequency of subjects experiencing physical critical days was found to be 18.100 (fe_{CD} = 18.100) with a total of 85.900 subjects on non-critical days (fe_{NCD} = 85.900).

The observed frequencies for the twenty-eight base measurements of soldiers who went AWOL on physical critical days varied between a low of 16 subjects to a high of 20, as can be seen in Table 1 on page 49. The mean values for the seven departure intervals displayed a smaller variance. A low of 17.00 was found for the 12 p.m. date of AWOL interval ($\bar{X}_5 = 17.00$) and the 12 a.m. date of AWOL interval had the highest with 19.00 ($\bar{X}_7 = 19.00$).

Results of the test for significance showed all seven means of departure intervals to be far below the tabled chi square value of 3.841 ($\chi^2_T = 3.841$) at a .05 alpha level ($\alpha = .05$). The highest chi square for the means was .024 at the 12 p.m. date of AWOL interval ($\chi^2_5 = .024$). No significant relationship was found to exist between the decision to go AWOL and physical cycle critical days. Therefore, the null hypothesis was retained.

Emotional Cycle Analysis

The expected frequencies for the emotional cycle were 14.872 for critical days ($fe_{CD} = 14.872$) and 89.128 for non-critical days ($fe_{NCD} = 89.128$). These changes from the previous analysis of the physical cycle were attributed to the increase in cycle length to twenty-eight days with the number of opportunities for critical days remaining the same.

As indicated in Table 2 on page 49, the twenty-eight base measurements of critical day AWOLs were all higher than the expected frequency. They ranged from a low of 20 to a high of 22. The means of the departure intervals showed exactly the same variance with the 12 a.m. day of AWOL interval at 20.00 ($\bar{X}_7 = 20.00$) and the 12 a.m. date prior interval at 22.00 ($\bar{X}_3 = 22.00$).

Table 1

Frequency Analyses of AWOL Occurring on Physical Cycle Critical Days

	Departure Times	Observed Frequency Per Birth Time 3 AM	9 AM	3 PM	9 PM	Mean	Chi Square
1.	12 PM*	19	19	18	18	18.50	.001
2.	6 PM*	16	19	19	18	18.00	.011
3.	12 AM*	16	16	19	19	17.50	.001
4.	6 AM†	18	16	16	19	17.25	.008
5.	12 PM†	18	18	16	16	17.00	.024
6.	6 PM†	20	18	18	16	18.00	.011
7.	12 AM†	20	20	18	18	19.00	.011

*Time represents date prior to reported AWOL.

†Time represents reported date of AWOL.

N = 104 fe_{CD} = 18.100 fe_{NCD} = 85.900 df = 1 α = .05 χ^2_T = 3.841

Table 2

Frequency Analyses of AWOL Occurring on Emotional Cycle Critical Days

	Departure Times	Observed Frequency Per Birth Time 3 AM	9 AM	3 PM	9 PM	Mean	Chi Square
1.	12 PM*	22	22	21	21	21.50	2.946
2.	6 PM*	22	22	22	21	21.75	3.192
3.	12 AM*	22	22	22	22	22.00	3.447
4.	6 AM†	20	22	22	22	21.50	2.946
5.	12 PM†	20	20	22	22	21.00	2.485
6.	6 PM†	20	20	20	22	20.50	2.063
7.	12 AM†	20	20	20	20	20.00	1.681

*Time represents date prior to reported AWOL.

†Time represents reported date of AWOL.

N = 104 fe_{CD} = 14.872 fe_{NCD} = 89.128 df = 1 α = .05 χ^2_T = 3.841

The highest chi square value was 3.447 for the 12 a.m. date prior interval ($\chi^2_3 = 3.447$), but this did not exceed the tabled value of 3.841 ($\chi^2_7 = 3.841$) at the .05 alpha level ($\alpha = .05$). Overall, the chi square values were moderate to high, but none were found to be significant. The null hypothesis that no relationship exists between the decision to go AWOL and emotional cycle critical days was retained.

Intellectual Cycle Analysis

The intellectual cycle, being the longest with a thirty-three day period, had the greatest disparity between the expected frequencies. For subjects experiencing critical days, the number was lowered to 12.584 ($fe_{CD} = 12.584$) and non-critical days expectations rose to 91.416 ($fe_{NCD} = 91.416$).

The variance between observed frequencies for critical day AWOLs was greatest for the intellectual cycle in both base measurements and departure interval means. Table 3 on page 51 shows the lowest base measurement as nine and the highest reaching 17. The 12 p.m. date prior departure interval recorded the lowest mean of 9.50 ($\bar{X}_1 = 9.50$). The greatest mean was 15.50 for the 12 a.m. day of AWOL interval ($\bar{X}_7 = 15.50$).

Even though the variance was greatest, the results of the chi square significance test showed small values because the variance was almost equally distributed above and below the expected frequency. The highest chi square was .604 at the 12 p.m. date prior interval ($\chi^2_1 = .604$). This was well below the tabled value of 3.841 ($\chi^2_T = 3.841$) at the .05 alpha level ($\alpha = .05$). No significant relationships were found, thus the null hypothesis stating no relationships exist between intellectual critical days and the decision to go AWOL was retained.

Table 3

Frequency Analyses of AWOL Occurring on Intellectual Cycle Critical Days

	Departure Times	Observed Frequency Per Birth Time 3 AM	9 AM	3 PM	9 PM	Mean	Chi Square
1.	12 PM*	9	9	10	10	9.50	.604
2.	6 PM*	14	9	9	10	10.50	.227
3.	12 AM*	14	14	9	9	11.50	.031
4.	6 AM†	14	14	14	9	12.75	.010
5.	12 PM†	14	14	14	14	14.00	.076
6.	6 PM†	17	14	14	14	14.75	.251
7.	12 AM†	17	17	14	14	15.50	.528

*Time represents date prior to reported AWOL.

†Time represents reported date of AWOL.

N = 104 fe_{CD} = 12.584 fe_{NCD} = 91.416 df = 1 α = .05 χ^2_T = 3.841

Table 4

Frequency Analyses of AWOL Occurring on All Combinations of Critical Days

	Departure Times	Observed Frequency Per Birth Time 3 AM	9 AM	3 PM	9 PM	Mean	Chi Square
1.	12 PM*	44	44	43	43	43.50	.556
2.	6 PM*	43	44	44	43	43.50	.556
3.	12 AM*	43	43	44	44	43.50	.556
4.	6 AM†	47	43	43	44	44.25	.806
5.	12 PM†	47	47	43	43	45.00	1.101
6.	6 PM†	50‡	47	47	43	46.75	1.969
7.	12 AM†	50‡	50‡	47	47	48.50	3.087

*Time represents date prior to reported AWOL.

†Time represents reported date of AWOL.

‡Significant at the .05 level.

N = 104 fe_{CD} = 39.312 fe_{NCD} = 64.688 df = 1 α = .05 χ^2_T = 3.841

Combined Cycle Analysis

The expected frequencies for the combined cycle analysis were determined by multiplying the product of the individual probabilities for non-critical day opportunities (19/23 x 24/28 x 29/33) by the sample size (N = 104). The number of subjects expected to experience one or more critical days was 39.312 (fe_{CD} = 39.312) and those with no critical days was 64.688 (fe_{NCD} = 64.688).

Three of the twenty-eight base measurements presented in Table 4 on page 51 were significant with 50 subjects experiencing one or more critical days. The three measurements were clustered together with two falling under the 3 a.m. birth time; one each for the 6 p.m. and 12 a.m. day of AWOL departure intervals. The third fell beneath the 9 a.m. birth time for the 12 a.m. day of AWOL interval. The chi square value for these measures was 4.245 (χ^2_6 = 4.245) and was greater than the tabled chi square value of 3.841 (χ^2_T = 3.841) at an alpha level of .05 (α = .05).

The means for all three date prior to AWOL departure intervals was constant at 43.50 ($\bar{X}_{1,2,3}$ = 43.50). Those means representing the day of AWOL intervals exhibited a steady rise to a maximum of 48.50 for the 12 a.m. interval ($\bar{X}_7$ = 48.50). The chi square value was 3.087 for the 12 a.m. day of AWOL interval (χ^2_7 = 3.087). All the interval means were higher than the expected frequency, but no significant relationships were indicated.

The difficulty of not having exact times available was evident in this analysis because of the mixed findings with the base measurements and the upward trend of departure interval means. It was impossible to predict which direction these measures would have taken

had the exact times been known. However, with respect to the three base measures, they were significant by less than half of one subject and even then required all of the subjects to have been born in the morning hours and to have departed during the latter part of the reported day of AWOL. As far as the means are concerned, it is not unusual for trends to appear and not be statistically significant. Therefore, the null hypothesis for no significant relationship between combined cycle critical days and the decision to go AWOL holds and is retained.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The final chapter is where the fruits of the study are harvested. The initial section reviews the elements of theory, research, data collection, and analysis in a summarized form. This is followed with an interpretation section which attempts to draw purposeful conclusions from the study results. The closing section contains recommendations for any future study or other disposition of biorhythm theory.

Summary

Biorhythm theory is one of many which claims a significant contribution toward the understanding of man's behavior. The theory revolves around a trio of biological rhythms which affect behavior by regulating available energy to inner resources. Each rhythm is viewed as two alternating half-cycles or phases when stored energy is at maximum or minimum levels. All three rhythms have discreet areas of control and are stable during both cycle phases. Instability occurs when the cycle changes phases and erratic behavior is most likely at these times. These changes are called critical days and are the core of biorhythm theory. Because of the harmonious interactions of the cycles, any critical day may affect any behavior.

Although the theory is almost a century old, it has only been popularized in the last decade by businessmen and other lay people.

Scientists and other professionals still are skeptical, initially because of the lack of proof. However, the major cause of disbelief appears to evolve from the outlandish claims of entrepreneurs out to make a fast profit from an unknowing public. Even scientists who study other biological rhythms shun biorhythm theory because these glamorized claims overshadow any similarities between known biological rhythms and biorhythms. These points were underscored by the review of biorhythm related literature.

The literature revealed the biorhythms were initially hypothesized in an attempt to explain periodic behavior observed in clinical and academic settings. These observations were made by three independent European professionals of different scientific backgrounds, none of whose original work has been translated into English. Instead, all the available resources are interpretations of scientific material in foreign languages made by non-scientists in English.

Where it is difficult to speculate on how much was lost and/or altered through such interpretation, it is even harder to comprehend the basis for the amplified claims of biorhythm proponents. Beyond the initial critical days concept, the theory has been advanced to the extreme of predicting sporting events down to the precise score. Such unfounded leaps from a working hypothesis to a precision predictive instrument make skepticism the only reasonable response for the scientific community.

Studies have done little toward clarification of the issue. Early research which is supportive of the theory is either untranslated or outdated. Recent studies reflect claims of proponents rather than tests of the original hypotheses. Researcher bias and theoretical

confusion are found all too frequently. Further complications vary from difficulties with study design to problems with securing reliable and complete data.

This study attempted to overcome the study design problems by seeking a behavior where the environmental role would serve in a minimal context and the major behavioral impetus would come from internal sources. Decision-making was determined to meet these requirements. The decision of Army enlistees to commit the offense of absence without leave was selected for two main reasons. First, it offered a type of decision where some unspecified amount of time was permitted within which to make the decision. This is a sharp contrast to the more popular accident-type biorhythm research where the operator may have made a decision, but the time factor was minute. The second consideration was the availability of reasonably reliable data sources since the selected discharge review documents offered not only information contained in the original military records, but the data had been rechecked through the discharge review process. The only drawback to the discharge review documents was the absence of exact birth and incident times.

A sample of 104 subjects was gathered from the 1978 discharge review case files. The sample was found to be generally representative of the study population. Emphasis was made about the study limitation concerning length of AWOL and the potential effects of long AWOL's in negating the appropriateness of the reason for leaving. This was necessary because a central issue in this study was for the AWOL to have been an inappropriate selection from available choices in a conflict situation.

Biorhythms for the sample were individually computed without the use of charts, computers, or other commercial means. The twenty-four hour interval prior to AWOL departure was the allotted time for the decision to have been made. Statistical analysis was performed using combinations of selected birth and departure times to determine if a relationship existed between the decision to leave and biorhythmic critical days. The method of analysis was a one-way Chi Square procedure with the expected frequencies determined by laws of probability. Analysis was performed for each biorhythm cycle separately and for a combination of all three cycles totaled together.

Conclusions

The conclusions of this study have not been generalized to any populations other than the defined population of Vietnam era Army enlistees. This was partially because of the lack of racial data. While no distinctions have been made about racial or ethnic differences in biorhythms, there is a question of unequal treatment toward minorities with regard to the punishment imposed for AWOL. Other partial reasons for the limited conclusions were the uncategorized variables of AWOL length and motivation for leaving. Of primary concern however, was the absence of exact birth and departure times. Reliable statistical data were gathered to make valid conclusions about the study population, but it was not felt this data was specific enough to carryover to larger or more varied populations.

The review of biorhythm literature revealed there are different interpretations of the basic theory. This raised the question as to which version was actually tested by this study. The closest source to

the initial concepts was Thommen. However, there is doubt as to the accuracy of Thommen's interpretations despite personal contact with the founders. It is improbable that Fliess or Swoboda, as professionals, would have been so definative about their hypothesized rhythms. Matters such as the fixed period and universal applicability are questionable especially considering the clinical nature of their discovery. The treatment of Hersey's work by biorhythm proponents supports the mishandling of scientific concepts suspicion. Hersey did observe a rhythm while performing an original research, but clearly stated there were variances both between and within individuals. Yet biorhythm promoters only cite the basic observation without the accompanying fluctuations. Thus, it may be said there are two distinct levels of biorhythm theory. The first is based upon clinical and academic observations about which little is known and the second, a commercialized presentation which is the center of media and public controversy. Since none of the studies reviewed cite original sources, the latter version has been the theory under scientific scrutiny. This was also the case for this study, therefore all conclusions of this study are reflections of the commercialized theory originally presented by Thommen.

Certain parameters pertaining to the adequacy of the sample as a qualified population representative were confirmed. The sample was dominated by males averaging around 19 years old. The mode for years of birth was in the expected range and the general span was appropriate. Screening procedures proved somewhat rigid, but resulted in a relatively balanced distribution of departure days indicating randomness. More subjects than anticipated had lengthy absences which may indicate some subjects had appropriate basis for going AWOL, but were punished for the

duration rather than reason. It may also mean the subject simply feared returning because he knew he was wrong. This question had to remain unanswered since it would have required a subjective determination by the researcher above that of the military. The only other unanticipated result in sampling was the high frequency of first year offenses accounting for two-thirds of all AWOL's. This may raise questions about the significance of maturity and personality variables, but these factors only approximate at what point during service AWOL is most likely to occur. The central issue of the exact day remains intact.

Results of the physical cycle analysis showed the observed frequencies to be evenly distributed above and below the expected frequency with no significant relationships found. Similar findings occurred with the intellectual cycle. The only difference was the intellectual cycle displayed a greater amount of deviation from the expected frequency, but still no significance was noted. Measurements for the emotional cycle were all above the expected number as were those for the combined cycle analysis. No significant relationships were found in either case, but three of the twenty-eight base measurements for the combination analysis were significant at the .05 alpha level.

The absence of exact times added a degree of difficulty to the formulation of conclusions since it was impossible to predict which direction the measures would have taken had these times been available. With respect to the three significant base measurements, they were significant by less than half of one subject, were limited to only the latest two departure intervals, and only appeared under the morning birth times. It is true that more births may be expected during the morning hours, but to maintain the level of significance observed the

births would have to be nearly all in the morning. Even if the birth ratio was biased to this extreme, the departure times would also have shown an extreme bias toward the latter part of the AWOL date. Meeting both of these requirements was highly unlikely.

Re-examination of the emotional cycle applying similar reasoning yields an opposite inference. Fifteen of these base measures lacked significance by the same half subject. However, the distribution among departure intervals was scattered across six of the seven intervals as well as all four birth times having at least three representatives measures each. In the case of the 12 a.m. date prior departure interval, the mean reflected the near significant observation. Additionally, the emotional cycle would be the most logical cycle to exhibit significance from the biorhythmic point of view because of the emotional factors surrounding AWOL. Still, under the study conditions, no significant relationships were found and the above inferences are insufficient to justify modification of the statistical findings.

The problem undertaken by this study was to determine if there was a significant relationship between biorhythmic critical days and the decision by first-term Army enlistees to commit the offense of absence without leave while stationed in the continental United States during the Vietnam era. The hypothesis was presented in the null form stating there was no significant relationship. Based upon the statistical evidence found, the null hypothesis must be retained. Therefore, the conclusion of this study is that no relationship existed between biorhythmic critical days and the decision to commit the offense of AWOL by Army enlistees during the Vietnam era.

Recommendations

First and foremost it is recommended that at least one of the original works of Fliess or Swoboda be located, translated, and published. This is essential if the theory is to be properly researched and evaluated. The responsibility lies with the scientific community because it is they who have the most to gain through understanding. No matter what becomes of the hypothesized rhythms, the questions of the initial observations need to be resolved.

There is a need for further and more comprehensive research in this area. Sufficient foundation for continued research is evidenced by the inconclusive results of previous research. Hersey's work demonstrated periodic behavior very similar to the original biorhythms even though some of his findings are direct contradictions of the commercialized theory. It is recommended that a large sample study be performed over a lengthy time span, such as a full year, utilizing a similar design to that of Hersey. The importance to science is not whether or not the biorhythm can be computed by birthdate or whether it is twenty-three days in length. The essential element at this time is whether or not such a phenomenon exists with any observable accuracy. Questions pertaining to causation, period, and commencement are all premature issues.

Finally, should there be interest in replication of this study, the following recommendations may be helpful. If possible, try to use real rather than paper subjects. This would give the opportunity to acquire birth times from the subject and closer approximations of decision and departure times. It also affords the researcher the chance to examine the details surrounding the incident with greater accuracy.

If the files are all that is available, the screening procedure can be less restrictive with regard to term of enlistment. Only those with less than three-year terms need be screened out. Distinctions should be made between the various lengths of AWOL because of the punishment implications.

In summary, much is still to be done in the area of biorhythm research. Virtually nothing concrete has been established despite all the controversy. Time and effort being expended quibbling should be spent researching in objective and unbiased studies. No theory should be scoffed at or ignored simply for the abuses of those who would profit from its reckless application.

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