

A Study for Influence of Biorhythm in Scholarly Record

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要 旨

人間은 누구나 출생에서 부터 사망에 이르기까지 신체내부에서 시작되는 身體리듬(physical rhythm), 感性리듬(emotional rhythm), 知性리듬(intellectual rhythm)이라고 불리는 세가지 리듬 곡선의 지배를 받는다. 이러한 바이오리듬은 신체적 내구성이라든가 창조성, 학교에서의 시험성적 같은 인간행동 내용에 서로 다른 리듬이 영향력을 미치게 된다.

本 研究에서 조사해 본 결과 학생의 저조기(low, weak)에 나타난 성적은 고조기(high, strong)에 나타난 성적보다 더 낮음을 볼 수 있었다.

따라서 과연 저조기가 인간능력에 영향을 끼쳐 성적이 고조기에 비하여 더 낮은 것인지 아니면 우연히 일어난 것인지를 如否를 統計的 方法으로 검증하였다.

또한 본 研究에서는 한 群을 대표할 수 있는 平均 혼합바이오리듬을 叢頻 혼합바이오리듬 개념을 이용하여 산출하였다.

ABSTRACT

From birth to death, every man is under the control of the three biorhythm curves that initiate from inner body. Those are called 'physical rhythm, emotional rhythm and intellectual rhythm'. These biorhythms have influence each other in human behaviour like physical endurance, creativity, record of examination.

The result of investigation indicates that the students' records in low level period are lower than those of in high. Therefore, it is verified statistically whether the biorhythm has effects on human ability in scholarly record or not. And also, this reserch calculates the average mixed-biorhythm which is representable for a group by using mode mixed-biorhythm.

1. INTRODUCTION

1.1 Purpose of research

The word "biorhythm" is derived from the Greek words, bios, meaning life, and rhythmos, meaning a regulated beat. Namely, biorhythm means rhythm theory of life.

Everything in nature has rhythm of regular period. For example, the earth revolves one rotation per a day 24 hours, revolves one rotation per 365 day around the sun, and the moon revolves one rotation per 29 day around the earth. The se rhythms of cosmos as is day and night, four seasons, the ebb and

flow of tide, the movement or generation of birds, fishes or animals and blooming, fruit-bearing, falling leaves of plant are the evidence that all the nature in earth has regular rhythm.

Man is one of the nature and not a exception, too. So the changes of living body of man's own peculiarity-what is called physical, emotional and intellectual rhythm-have regular cycle constituted by good or poor condition. These changes are repeating from birth to death in all man. These changes are called biorhythm collectively.

Purpose of this study is to investigate how does biorhythm relate to physical, emotional and intellectual change, how does biorhythm influence on the

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students and what relation exists between biorhythm and record? The purpose is to clarify the consistency between the factors of biorhythm and record and to scheme the efficient management of school affairs.

1.2 Object of research

Object is students in Industrial Engineering, Hanyang Univ.. Students are a 11,200 person (50 students by each grade). We investigated their matters, namely, sex, birth date and etc.

Table-1. is an arranged data by grade and Table-2 by birth year.

Table-1. List by grade

Grade	Code	Birth date	Name
1	01-01	1967.02.02	J.S. Moke
	.	.	.
	.	.	.
	.	.	.
	01-50	1967.01.24	J.W. Lee
2	02-01	1966.02.09	S.D. Kim
	.	.	.
	.	.	.
	.	.	.
	02-50	1966.01.24	J.W. Lee
3	03-01	1963.02.08	T.L. Jung
	.	.	.
	.	.	.
	.	.	.
	03-50	1966.01.31	Y.S. Kim
4	04-01	1962.02.01	W.S. Joe
	.	.	.
	.	.	.
	.	.	.
	04-50	1962.01.28	D.S. Song

Table-2. List by Birth date

Code	Name	Birth date
61-04-01	J.Y. Park	1961.02.10
61-04-02	I.B. Park	1961.04.05
.	.	.
.	.	.
.	.	.
64-03-06	S.H. Lee	1964.04.03
.	.	.
.	.	.
.	.	.
68-01-19	Y.H. Jung	1968.12.15

The code of before tables, for example 61-04-01. 61 means student's birth year, 04 means grade and 01 means that the student's birthday is the earliest among the 1961 birth year. Namely, student who was indicated by the number of 61-04-01 is a senior, was born in 1961 and is the earliest date of birth among the 1961 birth students.

Objects are shown in Table-3 and Table-4.

Table-3. Number of the objects by grade

Grade	Number of students
Freshman	50
Sophomore	50
Junior	50
Senior	50

Table-4. Number of the objects by birth year

Birth year	Number of students
1961	11
1962	17
1963	13
1964	31
1965	29
1966	38
1967	42
1968	19
Total	200

1.3 Analysis method

We calculated the biorhythms of 200 students with birth date using the software (file name: BASIC BIO).

The rhythm of most effective thing in students is supposed intellectual rhythm in the three biorhythms. This rhythm has a cycle per 33 day and it reflects intensity of mental power, understanding and decision power, deduction power, analysis power, power of organization, concentrating power, personal relations, confrontation ability, conversation and composition. We investigated the relation of body rhythm, emotion rhythm with intellectual rhythm laying stress on the intellectual rhythm.

We analyzed each student's biorhythm at Nov. and Dec., during the two months they had term examination. The day beginning intellectual rhythm-the point as ending to high level period in critical day-

is standard day.

Figure-1 is the output of a student's biorhythm in Nov. and Dec. In this figure, the standard day is Nov. 23. With the standard day in the center, the mutual relation of physical, emotional, intellectual

biorhythm is shown in Table-5. In Table-5, C means critical day and + means high (or strong) and low (or weak). Also, we can see the mode mixed-biorhythm of the student. In this case '-' is the mode mixed-biorhythm.

Table-5. Calculation process of mode mixed- biorhythm

Rhythm	1 2 3 4 5 6 7 8 9 0										1 2 3 4 5 6 7 8 9 0										1 2 3 4 5 6 7 8 9 0											
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2
P	-	-	-	-	-	C	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	C	+	+	+	
E	+	+	+	+	+	+	+	+	+	+	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	+	+	+	
I	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

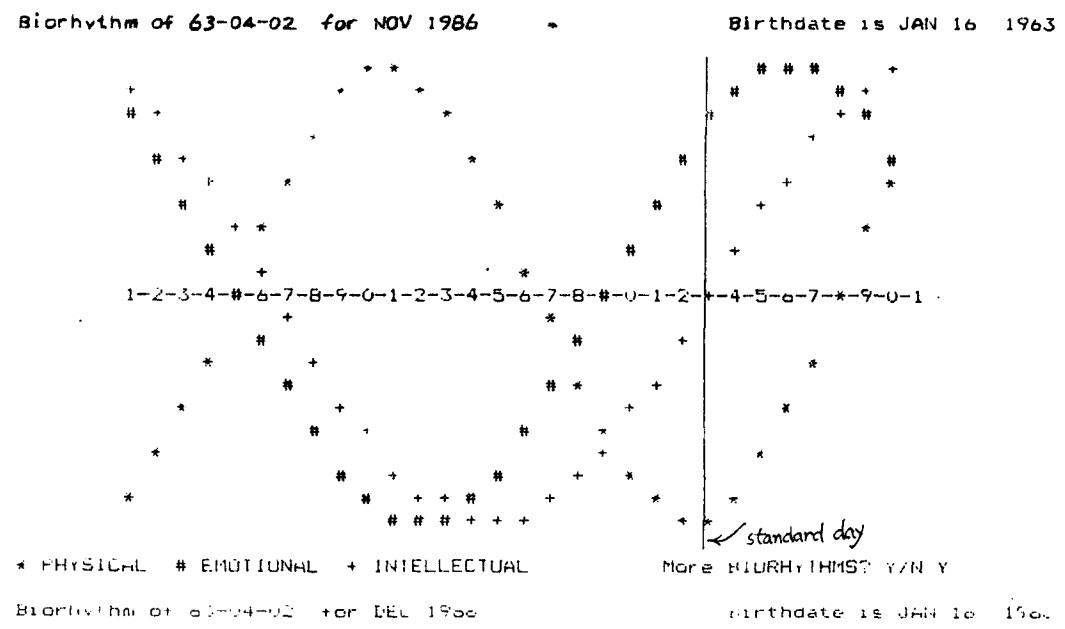


Figure-1. Output of biorhythm

A characteristic of these three rhythm in finding process is the fact that the result of studying another country, in another professional standpoint were discovered and verified simultaneously.

Physical and emotional rhythms were confirmed through experience like clinical observation or induction by analysis of data. But it is remarkable that the existence of intellectual rhythm was confirmed later the other two rhythms by statistical deduction analysis.

It is sometimes reasonable to think that "Is intellectual rhythm mixed of other several rhythm?". Because the existence of intellectual rhythm was confirmed by analysis, it is difficult to perceive it while physical and emotional rhythms were confirmed through scientific and medical process like experiment. But now, such questions have been disappeared thoroughly. Being of three rhythms can be confirmed by scientific and medical experiments.

2.2.3 Meaning of the word "biorhythm"

The existence of regular rhythm in life action of man or animal or plant was perceived from old days. We can notice that Aristoteles, a philosopher in Greece, observed ecological adaptation of sea urchin was growing up about the full of the moon.

By this fact, we can see that the ancients perceived phenomenon following rotation by rhythm in the body. They also tried to find several periodicity theory based on their perception. But they thought only one periodicity and tried to simplify the periodicity in nature like orb movement and tried to adapt this to man. The very it was defect and weak point at the first step in formation.

Since the time that biorhythm-PEI theory was arranged, fatalistic thought had disappeared. But yet the theoretical defects exist. Today, biorhythm's enlargement of social role causes from scientific way of thinking which had been based on the methodology of discovery of rhythms. For example, they divided the factors of human body into three elements, tried to find the period in each factor, observed the activity of man and they found the period in each factor through data analysis.

The word "biorhythm" consists of bio, meaning of life, and rhythm, meaning of regulated repetition beat. If we intentionally try to translate the word

biorhythm, it can be 'life periodicity' or 'life rhythm'. But because it is not necessary to translate, 'biorhythm' is universal validity.

Also, biorhythm means rhythm itself as well as study about formation and disappearance of periodic action power which is recognized widely in life action of not only man himself but also animal or plant.

From the accuracy of biorhythm, it is compared with the human body watch. In the human body watches, which undulates before or later a day 24 hours is called "day periodicity rhythm", which has plural day periodicity is called "plural day periodicity rhythm".

We will introduce extremely partial rhythm in the middle of action power, maybe exists a great many in man's body, which has comparatively long period around one month. "PEI" theory is named by the initial spelling of three rhythm.

- Physical = P
- Emotional = E (or Sensitivity=S)
- Intellectual = I

Relation of each rhythm is in Figure-2, 3. In this figures, we can see four points of PEI theory.

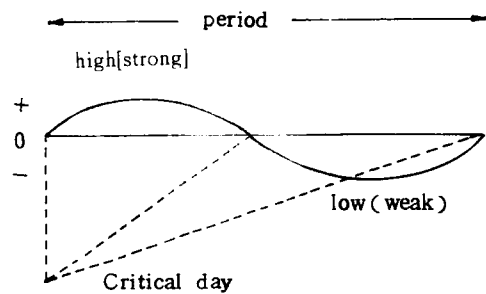


Figure-2.

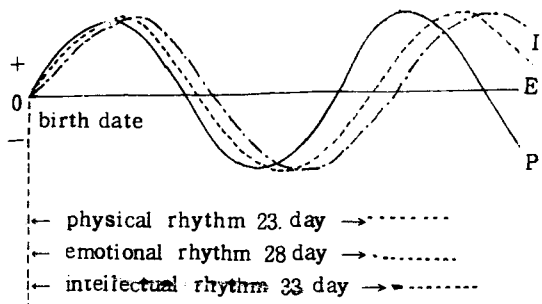


Figure-3.

2. THEORY OF BIORHYTHM

2.1 Practical technique of biorhythm

"Do you know biorhythm?" In this question, many people may look up into the questioner strangely. But the biorhythm is being utilized practically. Furthermore biorhythm shows us remarkable accomplishment at many group or community recently. Especially for incident prevention, biorhythm roles greatly. But till now, many people don't understand the concrete contents of biorhythm.

Therefore, for the unfolding of biorhythm,

- a. In what field biorhythm can be utilized?
- b. How is the research of biorhythm carrying?
- c. What is the achievement, being applied biorhythm?
- d. What can we do, to utilize the biorhythm?

is the necessary step to understand and utilize the biorhythm.

In other words, the effect is various according to the utilizing the method of biorhythm. Specially, if practical technique of biorhythm is understood and is utilized, it can help solving the hard and difficult problem. If it is utilized on the condition that is not understood well, it can be the source of misfortune. So we must understand, observe and judge the phenomena of biorhythm uprightly.

Therefore man, who meet biorhythm first through following explanation, can get a key which make it possible to realize theory and practice by arranging fragmentary and has utilized it in special field can get ability of diffusion and application, also.

2.2 What is biorhythm

2.2.1 Man is 23 day, woman is 28 day

Opinions about initial research of biorhythm are various. There is a view that Hippocrates referred to biorhythm about 2000 years before. But the opinion is dominant that theoretical formation is about the end of 19 century.

In the latter half of 1980s, Dr. Wilhelm Fliess(1859~1928), otorhinolaryngology doctor in Germany, found the period in attacking condition of disease. As a result of clinical observation, he found that there are type of 23 day and 28 day. He

announced this 1897 and published a book "Rhythm of life, biology theory" appending enormous data and analysis at 1906.

According to Fliess' opinion, man has the factor of male and female. He said that the period of male is 23 day that of female is 28 day.

Dr. Fliess succeeded as a doctor and was recommended for the president of scientific academy. But the more he announce many instances for proof, the cooler the reaction of this theory was.

Dr. Herman Swoboda (1873~1963), psychologist of Vienna University, found that the period of fever or cardiac disease spasm is 23 or 28 day. Inside of psychology-dreaming or recurrence of memory-he had got the proof of two types of biorhythm. Those were physical rhythm P causing from physical condition, with period of 23 day and emotional rhythm E (or S) causing from mental operation, especially operation of nerve tissue, with period of 28 day. Swoboda was recognized by his achievement and Vienna awarded him a special honour prize.

2.2.2 Newly discovered intellectual rhythm

The third rhythm, intellectual rhythm, was discovered 20 years after comparing to the two rhythms. In 1928, Dr. Alfred Teltsch, professor of Innsbruck college of engineering in Austria, analyzed the 3000 students' records including high school and college students. The result gave him confirmation of physical rhythm and emotional rhythm and another rhythm which had period of 33 day. It was named "intellectual rhythm I" because this new rhythm effected disappearance and extension of studying power and memorizing power.

Simultaneously, Dr. Rexford Hersey and Dr. Michael Bennett of Pennsylvania University in America, was requested from railroad company to study about efficiency and accident of skilled workmen during 5 years from 1928 to 1932. In this study, he found the rhythm which has period of 33 day.

As this, three rhythms were found from the end of 19 century to 1930s, and were systemized PEI theory. The existence of biorhythm was known widely by George Thommen.

(1) There are rhythms of body, emotion and intellection in man's body. Each rhythm has different periodicity. By figures, the first half of each period diffuses energy actively in+field. While the latter half of each period acts quietly with replenishing the energy which had been consumed in+field.

(2) The day that the rhythms transfer from+to- or from-to+ is called critical day (accident prone day). It is the day that peoples are apt to get much stress.

(3) These three rhythms do over again constant periodicity incessantly, from birth to death. In the figure, origin means birth date.

(4) Because the periods of rhythms are punctual like accurate watch, we can calculate the actions of rhythm in every people. It means the constancy and additivity of period.

By upper four points, because biorhythm indicates periodicity of life in human body, if we understand the periodicity, it will be able to bring more cheerful life to human. This data is very important to sales man as well as driving, aviating, producing operation, study master, manager's decision making and production planning.

2.3 Natural periodicity of biorhythm (scientific aspect of biorhythm)

Though it was true that biorhythm was misunderstood by mathematical simplicity and clarity, today's many peoples have interest in biorhythm. By doctors or investigators, the mystery of biorhythm is gradually being arranged scientifically. This scientific aspect has become one of necessary techniques for the development of man's ability by the evolution of biorhythm's theoretical function.

By this, biorhythm can be thought as a balance medical science and it is recognized as the positive and the negative in Chinese medical science or truth and untruth when disease breaks out. And also, it is recognized as phenomenon of feed back which is generated from sensitization of magnitude in hormone. This phenomenon is called "homeokinesis" in hormonology, it may be reasonable to think dynamic balance.

Original periodic wave is known what the action of hormone generates, for an example there is women's menstruation. Even today's science can't ex-

plain why the period of menstruation is 29 day, there is no other alternative to prove it empirically. This can be samely applicated to the period of biorhythm 23 day, 28 day and 33 day.

The only reality which can be explained is that normal functions is maintained by three kinds of gonad stimulating hormone from anterior lobe of the pituitary, as is follicle stimulating hormone, luteinizing hormone and luteinizing stimulating hormone, and by follicle hormone and progesterin from the ovary. For example, though the fact moving into a new house or getting a job can occur menstrual irregularity, this matter ferments a comical agitation imaginary pregnancy, occasionally. In other words, biorhythm is an another rhythm of life which has no relation with women's menstrual period.

3. Relation of biorhythm with students' records

3.1 Average mixed-biorhythm

Average mixed-biorhythm is the rhythm type of body, emotion and intellection which appears most frequently inspecting the each students' mode mixed-biorhythm and binding this to a sub-set as is grade or birth year. Every students' mode mixed-biorhythm is samely operated that of analysis the method of the introduction.

Table-6. Calculation process of 1961 birth year students' average mixed-biorhythm

CODE	PEI
61-04-01	+ + +
61-04-02	+ - +
61-04-03	+ - +
61-04-04	+ - +
61-03-05	+ - +
61-04-06	- + -
61-04-07	+ + +, - - +, + + -
61-04-08	- - -
61-04-09	- + +
61-03-10	+ + -
61-04-11	+ + -
Average mixed biorhythm	+ + +

3.1.1 Average mixed-biorhythm by birth year

By example, taking the average mixed-biorhythm of 1961 birth year(11 students). Mode mixed-biorhythms of 11 students are illustrated in table-6.

We can say that 1961 birth year students' average mixed-biorhythms are '+ + +' from the Table-6. Therefore representing birth dates of 1961 are following.

- .1961. Feb. 10
- .1961. Jun. 23

Using this method, regulating the average mixed-biorhythm, it results in Table-7.

Representing value which was obtained from Table-7 and average mixed-biorhythm by birth year are shown in Table-8.

3.1.2 Average mixed-biorhythm by grade

Research can be done by same method before section. For example, average mixed-biorhythms of freshmen 50 students are shown in Table-9.

As shown before table, average mixed-biorhythms of freshmen 50 students may be regarded as '- - +'. So the representing birth dates of freshmen are following.

- .1968. Dec. 1
- .1967. Jun. 10
- .1967. Jun. 14
- .1967. Jun. 24
- .1967. Jun. 28

Like this method, arranging the average mixed-biorhythm, the result is shown in Table-10.

Table-11 shows representing value of grade corresponding to average mixed-biorhythm from Table-10.

Table-7. Average mixed-biorhythm by birth year

Birth year	Average mixed birhythm
1961	+ + +
1962	+ + +
1963	- - -
1964	- + +
1965	+ + +
1966	- - +
1967	+ + +
1968	- - +, - - -

3.2 Relation of students' records

3.2.1 Students' records

Sophomore 50 students' records of Work Study (fall term) are illustrated for this rearch. Table-12 shows mode mixed-biorhythm and the records of Work Study of sophmore 50 students.

Table-8. Representing birth dates

Birth year	Representing birth dates
1961	1961.2.10
	1961.6.23
	1962.3.14
1962	1962.8.3
	1963.1.15
	1963.1.16
1963	1963.1.22
	1963.8.13
	1963.8.24
	1963.8.27
	1964.1.28
	1964.2.16
1964	1964.2.20
	1964.7.17
	1964.7.19
	1965.9.27
	1965.10.4
1965	1965.10.10
	1966.6.23
	1966.6.28
1966	1966.10.19
	1966.10.27
	1966.11.3
	1967.1.24
1967	1967.2.2
	1967.2.10
	1967.2.11
	1967.2.17
	1967.10.10
1968	1967.10.15
	1967.10.20
	1967.10.7
	1968.3.20
	1968.3.21
	1968.3.25
	1968.8.5
	1968.8.14
	1968.12.1

Table-9. Calculation process of freshmen' average mixed-biorhythm

Number	CODE	PEI
01	68-01-01	+ - +
02	68-01-02	+ - +
03	68-01-03	- + +, - + -
04	68-01-04	- + +, - + -
05	68-01-05	- + +, - + -
06	68-01-06	+ + +
07	68-01-07	- - -
08	68-01-08	- - -
09	68-01-09	- - -
10	68-01-10	+ - +
11	68-01-11	+ - +
12	68-01-12	+ - +
13	68-01-13	- + -
14	68-01-14	- - -
15	68-01-15	- - -
16	68-01-16	- + +
17	68-01-17	+ - -
18	68-01-18	- - +
19	68-01-19	+ + -
20	67-01-02	- - -, + + -
21	67-01-03	+ + +, + - -
22	67-01-04	+ + +, + - -
23	67-01-05	+ + +, + - -
24	67-01-10	- - -
25	67-01-12	- - -
26	67-01-13	- + +
27	67-01-15	- + +
28	67-01-16	- + +
29	67-01-17	- + +
30	67-01-18	- + +
31	67-01-19	+ - +
32	67-01-20	+ - +
33	67-01-21	- - +
34	67-01-22	- - +
35	67-01-23	- - +
36	67-01-24	- - +
37	67-01-25	+ + -
38	67-01-26	- + +
39	67-01-27	- + +
40	67-01-28	- + +
41	67-01-29	- + +
42	67-01-30	+ - -
43	67-01-31	+ - -
44	67-01-32	+ - -
45	67-01-33	+ - -
46	67-01-34	+ + +

47	67-01-35	+ + +
48	67-01-40	+ + -
49	67-01-41	+ - +
50	67-01-42	+ - +
Average mixed-biorhythm		- - +

Table-10 Average mixed-biorhythm by grade

Grade	Average mixed-biorhythm
1	- - +
2	+ - +
3	+ - +, - - +
4	- - +

Table-11. Representing birth dates by grade

Grade	Representing birth dates
1	1968.12. 1
	1967. 6.10
	1967. 6.14
	1967. 6.24
	1967. 6.28
2	1966. 7. 4
	1966. 7. 5
	1966. 7. 7
	1966. 7.12
	1966.11.16
	1966.11.28
	1966.12. 2
	1966.12.10
	1965.12. 1
	1965.12. 9
3	1966.10.19
	1966.11. 3
	1966.12.11
	1965. 1.13
	1965. 3.23
	1965.11.19
	1965.11.25
	1964. 4. 3
	1964. 4.17
	1964. 6.16
	1962.10.29
	1962. 5.24
	1962. 5.25
	1962.11.21
	1962.12. 8
	1962.12.19
	1961.12.22
	1964. 4.17

4	1964. 1.28
	1964. 2.16
	1964. 4. 5
	1964. 7.17
	1964. 7.19
	1964. 1.20
	1964. 1.28
	1964. 8.19

Table-12. Sophomores' records of Work Study

No.	Code	Name	Record	Mode mixed-biorhythm
01	67-02-01	Y.H.LEE	85	- + -
02	67-02-06	Y.C.JUNG	95	+ + +, + - -
03	67-02-07	Y.M.WAMG	90	+ + +, + - -
04	67-02-08	J.Y.SEO	95	+ + +, + - -
05	67-02-09	J.O.KIM	70	+ + +, + - -
06	67-02-11	C.O.CHOI	25	- - -
07	67-02-14	K.K.HONG	90	- + +
08	67-02-36	J.K.SEO	90	+ + +
09	67-02-37	H.C.LEE	96	+ + +
10	67-02-38	J.D.CHOI	83	+ + -
11	67-02-39	J.C.KIM	92	+ + -
12	66-02-01	J.S.KIM	80	- + -
13	66-02-02	J.O.LEE	80	+ + +
14	66-02-04	S.D.KIM	70	+ + +
15	66-02-07	Y.O.KWUN	93	+ + +
16	66-02-09	S.O.KIM	95	- - -
17	66-02-10	K.E.LEE	86	- - -
18	66-02-11	K.H.KIM	75	- - -
19	66-02-13	S.B.KIM	98	- - -
20	66-02-14	J.D.KIM	82	- - -
21	66-02-15	J.H.LEE	95	- - -
22	66-02-16	D.S.KIM	80	- + -
23	66-02-17	J.T.LEE	92	- - +
24	66-02-18	H.J.JEON	80	- - +
25	66-02-19	C.Y.LEE	95	+ - +, - - -
26	66-02-20	K.J.PARK	87	+ - +, - - -
27	66-02-21	H.Y.JUNG	87	+ - +, - - -
28	66-02-22	J.B.NOH	99	+ - +, - - -
29	66-02-23	S.Y.LEE	80	- + +
30	66-02-24	O.E.KIM	97	- + +
31	66-02-26	H.S.PYO	93	- + +
32	66-02-27	K.C.LIM	98	- + +
33	66-02-28	S.H.SHIN	80	+ - -
34	66-02-29	K.S.KIM	85	+ - -
35	66-02-31	H.B.KIM	87	- - +

36	66-02-32	D.S.SHIN	91	- - +
37	66-02-34	J.O.LEE	91	+ - +
38	66-02-35	C.Y.SONG	95	+ - +
39	66-02-36	J.S.PARK	85	+ - +
40	66-02-37	H.S.BANG	99	+ - +
41	65-02-05	D.S.JEON	97	- + +
42	65-02-09	D.H.BAEK	85	- - +
43	65-02-13	S.C.JUNG	80	+ - -
44	65-02-17	B.S.LEE	83	+ + +
45	65-02-18	K.S.LEE	99	+ + +
46	65-02-20	H.S.LIM	90	+ + -
47	65-02-22	J.H.SHIN	80	+ + -
48	65-02-26	O. SIM	85	+ - +
49	65-02-27	H.S.YEUN	85	+ - +
50	65-02-28	S.H.JIN	91	- + -

Table-13. Distribution of students' records according to mode mixed-biorhythm

Mode mixed-biorhythm	No.	Records	Avg. grade
+ + +	11	95 90 95 70 90 96 80 70 93 83 99	3.64
+ + -	4	83 92 90 80	3.50
+ - +	10	95 87 87 99 91 95 85 99 85 85	3.95
+ - -	7	95 90 95 70 80 85 80	3.50
- + +	6	90 80 97 93 98 97	4.17
- - +	5	92 80 87 91 85	3.60
- + -	4	85 80 80 91	3.37
- - -	11	25 95 86 75 98 82 95 95 87 87 99	3.50
Total	58		29.23 (3.65)

3.2.2 Sophomores' average mixed-biorhythm

As illustrated before section, sophomores' average mixed-biorhythm is + - +. Distribution of students' mode mixed-biorhythms is shown in Table-13.

3.2.3 Relation of intellectual rhythm with record

By the result of analyzing the sophomore 50 students' biorhythm, the students' number at high level period(+ + +, + - +, - + +, - - +) was 32. Because 8 students have two mode mixed-biorhythm, total number becomes 58 among the 50 students.

Table-14 shows the comparison of students' records according to the situation of the intellectual rhythm. From this table, we can say that the stu-

Table-14. Comparison of records according to intellectual rhythm

Intellectual rhythm	Average mixed-biorhythm	Avg. record
High level period	+ + +	3.64
	+ - +	3.95
	- + +	4.17
	- - +	3.50
	Total	15.36 (3.84)
Low level period	+ + -	3.50
	+ - -	3.50
	- + -	3.37
	- - -	3.50
	Total	13.87 (3.45)

Table-15. Distribution of biorhythms having low level period

Total No.	Total No. llp	Single llp			Double llp			Triple llp PEI
		P	E	I	PE	PI	EI	
58	47	6	10	4	5	4	7	11
	81	12.8	21	8.5	10.6	8.5	14.9	23.4

*llp:low level period

students in high level period have better records than those of the in low.

3.3 Relation of the record with low level period

From the result of the biorhythm of the sophomore 58 students(net 50 students), students in low level period of mode mixed-biorhythm are 47 students(81%). P-R was 6(12.8%), E-R was 10(21.3%), I-R was 4(8.5%), and double rhythm P-E was 5(10.6%), P-I was 4(8.5%), E-I was 7(14.9%), and triple rhythm P-E-I was 11(22.4%).

Table-16 shows distribution of records according to the type of low level period. We can see that the average record 3.87 at single low level period was higher than the total average record 3.65 and average record at double and triple low level period was lower than Table-16. Distribution of records according to the type of low level period

Types of low level period	Avg. record
Single low level period	3.87
Double low level period	3.49
Triple low level period	3.50

those of it. The average record at high level period was 3.64 this was similar to the total average record.

3.4 Significance test of biorhythm on the records

We applied Z-test in order to verify statistically that the biorhythm has effect on the students' records at low level period.

[Z-test]

Let N denote the number of cycle and n denote the number of low level period then the probability of which students' records appear in low level period is n/N, in high level period is (n-N)/N.

H₀:low level period has not effect on the students' records

H₁:low level period has effect on the students' records

Let K denote the number of students on the assumption H₀, and x denote the number of students those who got the record at low level period, then

$$f(x) = \frac{K!}{x! \binom{N}{x} \binom{N-n}{N-x}} \dots \dots \dots (3-1)$$

x=0, 1, 2, ..., k

When K is large number, by the Central limit theorem.

$$Z = \frac{\frac{x}{K} - \frac{n}{N}}{\sqrt{\frac{\frac{n}{N}(1 - \frac{n}{N})}{K}}} \dots\dots\dots (3-2)$$

Table-17. Cycle of biorhythm, table of llp

	P	E	I	PE	PI	EI	PEI
N	23	28	33	644	759	924	21,252
n	4	4	4	16	16	16	64
K	17	21	15	16	15	18	22
x	6	10	4	5	4	7	11

*** Though the number of low level period is P(11), E(13), I(16) per cycle, average frequency can be regarded as 7 time in average mixed-biorhythm calculation. But the frequency is calculated only 4 time.

Equation 3-2 becomes variable of the standard normal distribution simultaneously, critical region is right side. Therefore if we setting the significant level $\alpha = 0.05$, critical region must be $Z \geq 1.645$.

From the result by Table-17, Zp was 1.95, Ze 4.36, Zi 1.72 in single low level period, Zpe was 7.40, Zpi 6.62, Zei 12.10 in double low level period, and Zpei was 17.99 in triple low level period. As this, Z values are all larger than 1.645, it means that Z values have very high significance level price.

Therefore, it is proved that the students' records at low level period are lower than those of high level period. And also, overlapped rhythm(double or triple low level period) had higher significance level price than that of the single low level period.

4. CONCLUSIONS

This study analyzed the relation of the biorhythm with students' records. The results said that 47 students(81%) got the records at the low level

period of biorhythm among the 58 students(net 50 students).

The result of this study makes following items clear.

1. Mode mixed-biorhythm which is representable of a sub-set(grade, birth year and etc.) is calculated by individual's mode mixed-biorhythm.

2. The students whose intellectual rhythms are in high level period get better records than those of at low level period, which is reflected in mental power, comprehensive faculty, judging power, logical organizing power and concentrating power.

3. The records at single low level period were higher than those of double or triple low level period. Therefore it is clear that the low level period of biorhythm has effect on the students' records. It is expected that the control of the students' biorhythm assists in school affairs and construction of curriculum including the date of examination and the control of attendance. From this result, though the efficient control of the biorhythm will contribute to improving the man's ability, but this study is limited to students' records inevitably.

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