THE EFFECT OF WEATHER ON THE SUSTAINED ATTENTION OF HIGH SCHOOL STUDENTS

by

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INTRODUCTION

Weather has always been used in literature as a main theme around which interesting stories have been developed. The personalities of many characters found in these stories change according to the condition of the weather. Perhaps, because of reading literature, most people believe that weather effects human behavior in every conceivable way. Some teachers have the opinion that on certain days students do not study and are more difficult to discipline than on other days. The cause for this variation in student behavior is thought to be due to the variation in the weather. An objective study, to determine if there is any truth in the belief that weather effects the studying of children, should be interesting.

There are many studies to be found in scientific literature that deals with mental and physical work, but there are very few that show the relation between weather and the sustained attention of students.

One of the most important studies was made by Huntington who examined the records of 1,700 West Point and Annapolis students and correlated their work on various days with the weather conditions of those days. His conclusions are as follows:

1. Change in barometric pressure have little effect.

2. Humidity possesses a considerable degree of importance.
3. Temperature is most important factor.[1]

The New York State Ventilation Commission performed many experiments to show the relation between weather conditions and physical and mental work. It was found that the comfort of the individual determines the amount of physical work that can be accomplished. The most important factors are temperature and humidity. Consequently, weather does have a marked effect on physical production.

The results of the experiments of the New York State Ventilation Commission upon mental work are in strong contrast to their findings for physical work. A variety of mental operations ranging from simple cancellation of numbers to completed judgements of specimens of composition were investigated under extremes of temperature and humidity. These results are:

> "With the forms of work and length of period used, we find that when an individual is urged to do his best he does as much and does it as well, and improves as rapidly in hot, humid, stale, and stagnant air condition (86 degrees F., 80% relative humidity, with no air or only recirculated air, and with no movement of air save what is caused by events in the room and in case of recirculation by the recirculating force) as in an optimum condition (68 degrees F., 50% relative humidity, 54 cu.

1. Huntington, E., Civilization and Climate

> ft. per person per minute of outside air introduced)".[2] "We find further that when an individual is given work to do that is of no interest or value to him and is deprived even of means of telling how well he does it, and is in other ways tempted to relax standards and do poor quality, he still shows no inferiority in the quality of the product produced in stagnant air at 86 degrees F. 80% relative humidity with 30 to 40 parts of CO_2 per 10,000"[3] "There is some evidence that he spends more time on the work, but even this is not certain." [4]

An experiment made under the direction of the New York Ventilation Commission in which children were tested as to the effect of ventilation in a school room on the achievement of school children found as follows:

> "In so far as this single experiment may be accepted, as the best present evidence, the intellectual progress seems not to be imparied by an increase of carbon dioxide from 8 to 10 parts in 10,000 or by recirculation of washed air, to an extent that diminishes the steam consumption to 50 per cent"[5]

Gates says about the New York State Ventilation Commission's studies:

> "The atmospheric conditions which are encountered in ordinary life, then, however uncomfortable some of them may be, have no appreciable effect upon efficiency in performance, or improvement, in mental and light motor work"[6]

This study was made in the Yuma Union High School,

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2. Thorndike, E. L. ; McCall, W. A. and Chapman, J. C. Ventilation in Relation to Mental Work
3. Ibid
4. Ibid
5. Winslow, C. E. A.; Kimball, D. D.; Lee, F. S.; Miller J.A. Phelps, E. B. and Thorndike, E. L., "The Effect of Outside Air and Recirculated Air upon the Intellectual Achievement and Improvement of School Pupils", School and Society, Vol. 3, p. 684 (May 6, 1916)
6. Gates, Arthur I., Psychology for Students of Education

Yuma, Arizona. It was possible to get objective material by using an observer and the Morrison Profile Technique.[7] Twelve students could be observed in the study halls for a 25 minute period each day and the observation continued with the same student at the same time of day for 15 continuous school days. Sustained attention profiles were made of 30 students and from these the percentages were calculated. The information on the weather was obtained from the United States Weather Bureau at Yuma, Arizona.

THE PROBLEM

Since weather is composed of four important factors the problem resolved itself into: To determine what effect, if any, humidity, temperature, wind velocity and barometric pressure has upon the amount of time that a student assigned to work in a study hall actually studies.

7. Morrison, Henry C., Practice of Teaching in Secondary Schools, p. 137

CHAPTER I

COLLECTION OF DATA

Since weather is composed of four important factors the problem resolved itself into: To determine what effect, if any, humidity, temperature, wind velocity and barometric pressure has upon the amount of time that a student assigned to work in a study hall actually studies.

The Yuma Union High School of Yuma, Arizona, which has about 600 students in average daily attendance, was selected as a suitable place in which to make the study. In this school there are six periods in the school day, each 54 minutes long, which made it possible to observe two students in each study hall for 25 minutes each. Each study hall had a different teacher except the first and second which had the same teacher. In order to eliminate the possibility of change in teacher influence, the students were observed at the same time each period for 15 continuous school days that they were in school, thereby insuring constant teacher influence for each individual.

The problem of getting the objective data in order to determine the amount of time a student actually applied himself to his work during the observation period was

solved by having an observer make use of the Morrison Profile Technique on sustained attention.[7]

With the objective information of the per cent of time a student studied during the observed period, and having about the same school conditions present each day, a correlation with the weather conditions should show if the weather has any effect upon the sustained attention of students. This study is not based upon the opinions of any person but actual objective information.

The observer (Miss Logan) selected was a Post Graduate High School student who had been attending school the previous semester. Since this girl was not a stranger, the students did not become curious and there was no indication that any student knew that they were under observation. The students to be observed were selected at random; 17 boys (8 freshmen, 6 sophomores and 3 juniors) and 17 girls (9 freshmen, 3 sophomores, 2 juniors and 3 seniors).

It was possible to get the required information on the weather from Mr. James A. Gordon, Meterologist, at the United States Weather Bureau which is located not more than 10 blocks from the Yuma Union High School. This information is part of the permanent record of the

7. Morrison, Henry C., Practice Teaching in Secondary Schools, p. 137

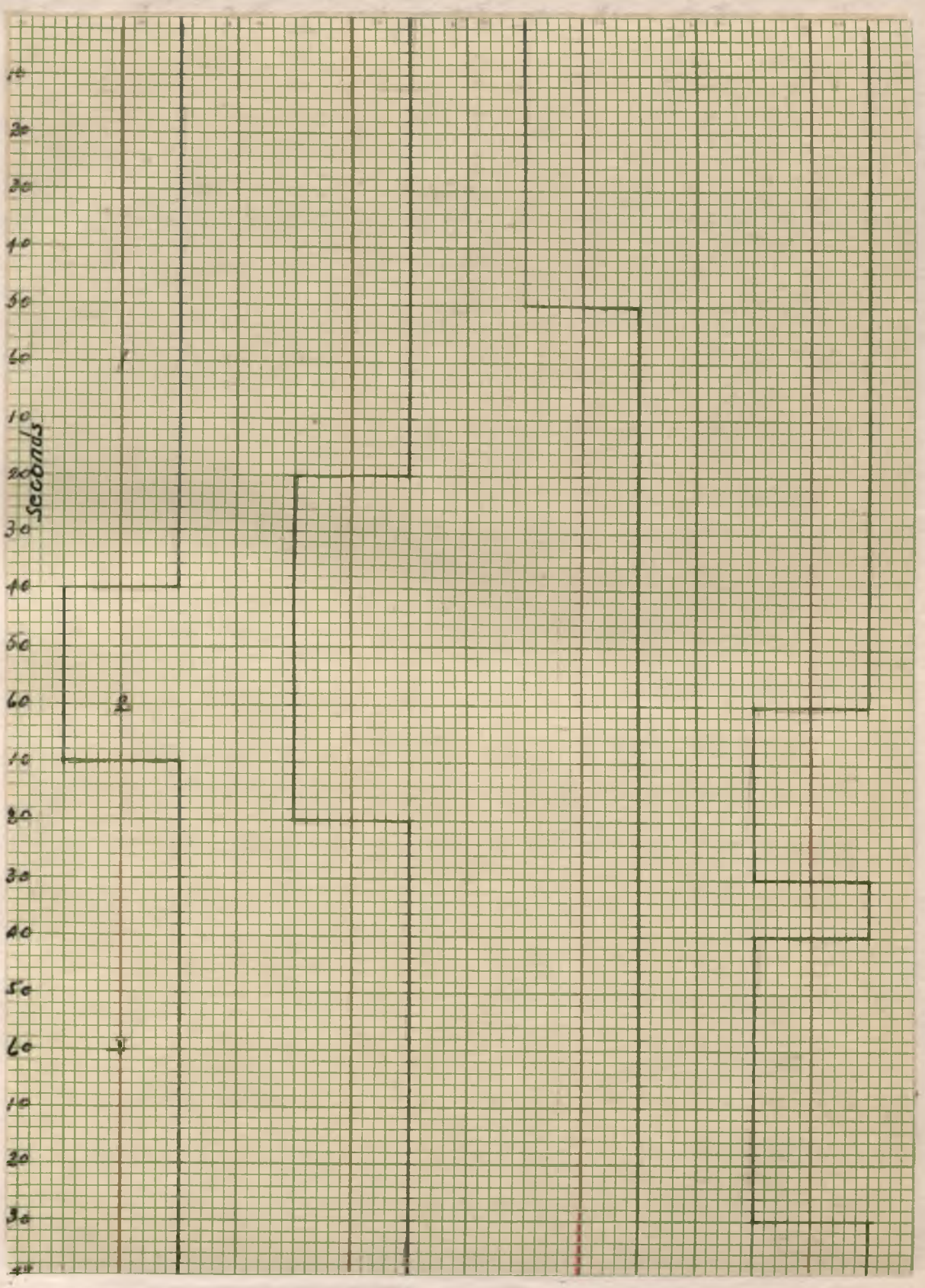
United States Weather Bureau.

Technique

The regular Morrison Sustained Attention Profile blanks were not available, so it became necessary to make them. By fastening seven sheets of graph paper together, it was possible to make a profile graph covering a period of 25 minutes by making each space represent two seconds of elapsed time. A center line was made so there would be 10 spaces on each side of it. The paper was wide enough to get four profiles on each sheet. A vertical line made 5 spaces to the right of the center line represents the time during which a student studied and the vertical line 5 spaces to the left of the center line represents the time wasted. There is a copy of a sheet of profiles on the next page which shows how four students spent their time for the first 220 seconds of the observed period.

The observer recorded the time to the nearest 10 seconds. This was found to be more accurate than trying to get the study time to the nearest second because of the time required to tell whether the student had actually stopped studying or had just momentarily raised his head. If a student was permitted to go to the library, the observer followed. If permitted to go to any class room, the observer found an excuse to go there also. The time spent in halls or rest rooms was considered wasted.

1st Period	1st Period	2nd Period	2nd Period
Student No. 18	Student No.25	Student No. 10	Student No. 11



Sustained Attention Profile, February 22

The observer made only one profile at a time except on four days when she observed a few students two at a time because of their "make up" activities. There was no difficulty experienced, and there is no reason to believe that the observations were different on those days from those on which only one student at a time was observed. It proved to be possible to observe two students at the same time provided they both remained in the study hall.

Limitations.

If a student was absent, the record was continued when the student returned until 15 records were made. It was necessary to drop four students for the records because of prolonged absences. Three times the 6th period was shortened because of long Assemblies. In these cases the time of student observations overlapped but due to the fact that the same teacher was in charge there is no reason to believe that this would change the results of the study.

The study began February 11, 1935 and continued every school day until April 15, 1935. This is 5 more than the 45 school days required but it was necessary to continue the extra five days in order to get a fifteen day record for a few students. The study was made during the second semester of the school year because it was thought that there would be fewer distractions during this period than during the first semester.

The football season is during the first semester which has a tendency toward unrest because the whole school participates in rallies. Also the freshmen are not yet accustomed to their new surroundings at the beginning of the first semester.

CHAPTER II

ANALYSIS OF DATA.

Calculations.

From the profile of each student, the per cent of the total time during which he was supposed to be studying that he was actually giving his attention to his work was calculated and recorded. This information can be found in Table I, page 12. There is a record for each student observed of the amount of time that he studied during the observation period for 15 days.

From the records in Table I, three representative students (No. 19, No. 1 and No. 32) were selected and correlations and graphs made of the per cent of observed study period actually devoted to study and the four major weather factors, that is, humidity, temperature, barometric pressure and wind velocity.

The humidity reading at noon was used because it nearly represents the average of the school day. It is recorded in per cent of saturation. The temperature record used is the mean of temperature readings for the day and is degrees Fahrenheit. The maximum velocity of the wind is measured in miles per hour. The six P. M. reading of barometric pressure is recorded in centimeters.

Student No. 19 was a senior girl who had made the

TABLE I. RECORD OF PER CENT OF OBSERVED STUDY PERIOD ACTUALLY DEVOTED TO STUDY, HUMIDITY, TEMPERATURE, BAROMETRIC PRESSURE AND WIND VELOCITY.

Per Cent of Total Time Devoted to Study

Period	Student No.	Feb. 11	Feb. 12	Feb. 13	Feb. 14	Feb. 15
1st	18	66	75	64	66	62
1st	25	33	50	61	36	61
2nd	10	78	92	80	73	60
2nd	11	71	69	83	87	Absent
3rd	19	8	36	64	70	0
3rd	15	16	58	62	17	46
4th	12	71	100	71	77	5
4th	17	22	93	12	Absent	67
5th	24	71	81	69	37	33
5th	23	83	13	75	51	38
6th	22	82	22	92	52	97
6th	21	100	100	54	80	63
Average		58	65	66	59	48

Relative Humidity in Percentages

Time	Feb. 11	Feb. 12	Feb. 13	Feb. 14	Feb. 15
6 A. M.	89	71	86	74	22
Noon	44	54	52	46	15
6 P. M.	45	42	47	42	12
Average	59	56	62	54	16

Temperature in Degrees Fahrenheit

	Feb. 11	Feb. 12	Feb. 13	Feb. 14	Feb. 15
Maximum	68	66	70	72	65
Minimum	48	50	44	47	53
Mean	58	58	57	60	59

Barometric Pressure in Centimeters

Time	Feb. 11	Feb. 12	Feb. 13	Feb. 14	Feb. 15
6 A. M.	29.89	29.61	29.83	29.97	30.24
6 P. M.	29.75	29.71	29.86	30.01	30.34

Wind Velocity in Miles per Hour

	Feb. 11	Feb. 12	Feb. 13	Feb. 14	Feb. 15
Direction	N & NE	N	S	W	N
Maximum Velocity	11	18	18	19	28

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	Feb. 18	Feb. 19	Feb. 20	Feb. 21	Feb. 22
1st	18	71	36	82	67	80
1st	25	58	83	83	86	89
2nd	10	34	63	84	64	74
2nd	11	Absent	77	55	43	67
3rd	19	69	50	91	55	27
3rd	15	46	71	53	58	34
4th	12	78	86	85	81	87
4th	17	83	75	78	91	33
5th	24	16	70	43	46	38
5th	23	41	64	61	48	51
6th	22	78	62	51	81	27
6th	21	100	95	Absent	0	71
Average		61	55	70	60	56

Relative Humidity in Percentages

Time	Feb. 18	Feb. 19	Feb. 20	Feb. 21	Feb. 22
6 A. M.	44	42	65	69	47
Noon	18	20	23	18	16
6 P. M.	16	18	19	18	15
Average	26	27	36	35	26

Temperature in Degrees Fahrenheit

	Feb. 18	Feb. 19	Feb. 20	Feb. 21	Feb. 22
Maximum	81	85	85	81	85
Minimum	45	49	49	50	48
Mean	63	67	67	66	66

Barometric Pressure in Centimeters

Time	Feb. 18	Feb. 19	Feb. 20	Feb. 21	Feb. 22
6 A. M.	30.28	30.20	30.15	30.10	30.13
6 P. M.	30.18	30.11	30.07	30.10	30.01

Wind Velocity in Miles per Hour

	Feb. 18	Feb. 19	Feb. 20	Feb. 21	Feb. 22
Direction	NE	NE	E	N	NE
Maximum Velocity	8	9	6	12	6

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	Feb. 25	Feb. 26	Feb. 27	Feb. 28	Mar. 1
1st	18	65	67	63	45	55
1st	25	65	80	89	64	67
2nd	10	75	64	66	16	60
2nd	11	52	57	53	70	54
3rd	19	71	87	61	17	56
3rd	15	Absent	Absent	19	39	36
4th	12	98	Absent	84	64	97
4th	17	100	73	88	85	77
5th	24	65	43	46	31	35
5th	25	55	59	41	30	36
6th	22	28	55	55	72	39
6th	21	62	55	59	80	75
Average		67	64	60	51	57

Relative Humidity in Percentages

Time	Feb. 25	Feb. 26	Feb. 27	Feb. 28	Mar. 1
6 A. M.	27	23	40	40	52
Noon	19	13	14	14	20
6 P. M.	13	10	26	26	23
Average	20	15	27	27	32

Temperature in Degrees Fahrenheit

	Feb. 25	Feb. 26	Feb. 27	Feb. 28	Mar. 1
Maximum	64	69	78	74	77
Minimum	43	43	41	44	52
Mean	54	56	60	59	64

Barometric Pressure in Centimeters

Time	Feb. 25	Feb. 26	Feb. 27	Feb. 28	Mar. 1
6 A. M.	30.07	30.28	30.09	30.09	29.95
6 P. M.	30.17	30.24	30.02	30.09	29.86

Wind Velocity in Miles per Hour

	Feb. 25	Feb. 26	Feb. 27	Feb. 28	Mar. 1
Direction	N	N	NE	NE	S
Maximum Velocity	25	7	6	5	6

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	Mar. 4	Mar. 5	Mar. 6	Mar. 7	Mar. 8
1st	1	43	39	23	15	17
1st	27	76	95	94	72	95
2nd	3	71	27	35	54	16
2nd	4	90	93	77	87	91
3rd	28	29	87	69	67	25
3rd	6	76	79	73	74	89
4th	7	55	87	71	77	75
4th	8	11	80	51	23	0
5th	9	50	81	43	47	100
5th	13	45	65	46	0	0
6th	14	59	89	93	41	53
6th	26	64	66	34	0	19
Average		56	74	59	46	48

Relative Humidity in Percentages

Time	Mar. 4	Mar. 5	Mar. 6	Mar. 7	Mar. 8
6 A. M.	65	62	72	57	51
Noon	35	32	26	26	34
6 P. M.	36	27	20	26	30
Average	45	40	39	36	38

Temperature in Degrees Fahrenheit

	Mar. 4	Mar. 5	Mar. 6	Mar. 7	Mar. 8
Maximum	68	66	70	73	66
Minimum	46	47	43	49	49
Mean	57	56	56	61	58

Barometric Pressure in Centimeters

Time	Mar. 4	Mar. 5	Mar. 6	Mar. 7	Mar. 8
6 A. M.	29.94	29.93	30.02	29.86	29.92
6 P. M.	29.69	29.97	29.94	29.73	29.93

Wind Velocity in Miles per Hour

	Mar. 4	Mar. 5	Mar. 6	Mar. 7	Mar. 8
Direction	W	W	S	NE by S	W
Maximum Velocity	10	20	5	17	11

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	Mar. 11	Mar. 12	Mar. 13	Mar. 14	Mar. 15
1st	1	26	20	19	51	43
1st	27	95	77	94	98	97
2nd	3	59	42	Absent	65	53
2nd	4	88	93	97	52	84
3rd	28	28	46	Absent	74	29
3rd	6	69	64	89	81	91
4th	7	53	79	Absent	87	71
4th	8	81	67	91	100	72
5th	9	55	26	78	Absent	Absent
5th	13	20	0	80	36	59
6th	14	35	72	54	7	Absent
6th	26	77	22	62	56	41
Average		57	51	74	62	64

Relative Humidity in Percentages

Time	Mar. 11	Mar. 12	Mar. 13	Mar. 14	Mar. 15
6 A. M.	24	51	43	61	61
Noon	16	17	20	18	18
6 P. M.	16	17	21	16	14
Average	19	28	28	32	31

Temperature in Degrees Fahrenheit

	Mar. 11	Mar. 12	Mar. 13	Mar. 14	Mar. 15
Maximum	72	80	84	88	81
Minimum	44	43	51	56	52
Mean	58	62	68	72	66

Barometric Pressure in Centimeters

Time	Mar. 11	Mar. 12	Mar. 13	Mar. 14	Mar. 15
6 A. M.	30.23	30.27	30.10	29.98	29.91
6 P. M.	30.23	30.11	29.98	29.89	29.89

Wind Velocity in Miles per Hour

	Mar. 11	Mar. 12	Mar. 13	Mar. 14	Mar. 15
Direction	N	NE	NE	S	N
Maximum Velocity	18	12	9	5	9

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	Mar. 18	Mar. 19	Mar. 20	Mar. 21	Mar. 22
1st	1	23	42	9	51	12
1st	27	95	100	2	93	99
2nd	3	45	75	99	98	29
2nd	4	88	84	96	95	94
3rd	28	44	74	59	93	42
3rd	6	67	82	83	92	94
4th	7	Dropped	Dropped	Dropped	Dropped	Dropped
4th	8	85	9	90	82	68
5th	9	Absent	38	67	Absent	45
5th	13	45	45	35	23	17
6th	14	49	75	79	65	50
6th	26	41	73	56	89	77
Average		58	72	61	78	57

Relative Humidity in Percentages

Time	Mar. 18	Mar. 19	Mar. 20	Mar. 21	Mar. 22
6 A. M.	58	45	72	62	62
Noon	10	34	26	27	17
6 P. M.	29	30	22	21	16
Average	32	36	40	37	32

Temperature in Degrees Fahrenheit

	Mar. 18	Mar. 19	Mar. 20	Mar. 21	Mar. 22
Maximum	78	66	71	76	74
Minimum	48	47	37	40	43
Mean	62	56	54	58	58

Barometric Pressure in Centimeters

Time	Mar. 18	Mar. 19	Mar. 20	Mar. 21	Mar. 22
6 A. M.	29.89	29.87	30.09	30.06	30.05
6 P. M.	29.83	30.00	29.99	29.99	29.95

Wind Velocity in Miles per Hour

	Mar. 18	Mar. 19	Mar. 20	Mar. 21	Mar. 22
Direction	W	W	SW	W	N
Maximum Velocity	12	27	6	6	30

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	Mar. 25	Mar. 26	Mar. 27	Mar. 28	Mar. 29
1st	30	79	69	97	39	81
1st	31	77	81	Absent	87	47
2nd	32	97	76	86	91	71
2nd	33	53	81	0	29	91
3rd	34	97	Absent	61	82	81
3rd	35	82	88	80	38	0
4th	36	65	99	Absent	88	94
4th	41	Absent	93	Absent	91	57
5th	38	41	95	Absent	71	31
5th	39	90	82	Absent	Absent	0
Average		76	85	65	68	55

Relative Humidity in Percentages

Time	Mar. 25	Mar. 26	Mar. 27	Mar. 28	Mar. 29
6 A. M.	43	53	46	34	69
Noon	19	15	17	10	21
6 P. M.	17	14	14	11	17
Average	26	27	26	18	36

Temperature in Degrees Fahrenheit

	Mar. 25	Mar. 26	Mar. 27	Mar. 28	Mar. 29
Maximum	78	83	86	88	86
Minimum	41	43	48	50	50
Mean	60	63	67	69	68

Barometric Pressure in Centimeters

Time	Mar. 25	Mar. 26	Mar. 27	Mar. 28	Mar. 29
6 A. M.	30.05	29.92	29.79	29.87	29.90
6 P. M.	29.94	29.80	29.77	29.83	29.78

Wind Velocity in Miles per Hour

	Mar. 25	Mar. 26	Mar. 27	Mar. 28	Mar. 29
Direction	N	SW	NE & SW	N	SW
Maximum Velocity	4	8	8	9	9

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	April 1	April 2	April 3	April 4	April 5
1st	30	80	Absent	65	81	83
1st	31	91	Absent	60	78	Absent
2nd	32	94	87	94	95	81
2nd	33	36	67	75	58	88
3rd	34	3	71	65	82	87
3rd	35	85	77	79	88	95
4th	36	97	Absent	89	83	43
4th	41	93	Absent	75	86	88
5th	38	Absent	61	26	78	67
5th	39	79	74	77	31	77
Average		73	73	71	76	79

Relative Humidity in Percentages

Time	April 1	April 2	April 3	April 4	April 5
6 A. M.	70	77	79	54	57
Noon	38	35	29	33	23
6 P. M.	30	21	26	32	24
Average	46	44	45	40	35

Temperature in Degrees Fahrenheit

	April 1	April 2	April 3	April 4	April 5
Maximum	82	84	86	82	80
Minimum	52	49	51	61	57
Mean	66	66	68	72	68

Barometric Pressure in Centimeters

Time	April 1	April 2	April 3	April 4	April 5
6 A. M.	29.87	29.91	29.94	29.91	29.96
6 P. M.	29.82	29.86	29.83	29.87	29.94

Wind Velocity in Miles per Hour

	April 1	April 2	April 3	April 4	April 5
Direction	S	SW	W	W	W
Maximum Velocity	9	9	8	21	19

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	Student No.	Apr. 8	Apr. 9	Apr. 10	Apr. 11	Apr. 12
1st	30	Absent	Absent	65	81	90
1st	31	70	42	Dropped	Dropped	Dropped
2nd	32	87	91	91	90	91
2nd	33	Dropped	Dropped	Dropped	Dropped	Dropped
3rd	34	69	87	63	75	34
3rd	35	79	92	95	81	83
4th	36	5	45	Absent	Absent	65
4th	41	89	89	95	93	Absent
5th	38	41	46	82	58	20
5th	39	59	80	81	96	50
Average		62	72	82	82	62

Relative Humidity in Percentages

Time	Apr. 8	Apr. 9	Apr. 10	Apr. 11	Apr. 12
6 A. M.	55	42	66	48	47
Noon	33	28	18	12	9
6 P. M.	36	26	14	10	10
Average	41	32	33	23	22

Temperature in Degrees Fahrenheit

	Apr. 8	Apr. 9	Apr. 10	Apr. 11	Apr. 12
Maximum	81	70	78	85	93
Minimum	57	51	43	48	51
Mean	69	60	60	66	72

Barometric Pressure in Centimeters

Time	Apr. 8	Apr. 9	Apr. 10	Apr. 11	Apr. 12
6 A. M.	29.68	29.80	30.05	30.06	29.98
6 P. M.	29.57	29.89	30.02	29.98	29.85

Wind Velocity in Miles per Hour

	Apr. 8	Apr. 9	Apr. 10	Apr. 11	Apr. 12
Direction	W	W	W	W	E
Maximum Velocity	28	30	8	9	9

TABLE I. CONTINUED

Per Cent of Total Time Devoted to Study

Period	St. No.	Mar. 4	Mar. 5	Mar. 6	Mar. 25	Apr. 15
1st	30					99
1st	27				51	
2nd	4				83	
2nd	11	71	23			
3rd	28					
3rd	34					4
3rd	15	2		83		
4th	12	91				
4th	17	78				
5th						18
6th	21	90				

Period	St. No.	Apr. 16	Apr. 17	Apr. 18	Apr. 19	
1st	30	67	93			
4th	36	86	91	86	78	
4th	41	79	69	63	36	
5th	38	57				
5th	39	0	67			

Relative Humidity in Percentages

Time	Apr. 15	Apr. 16	Apr. 17	Apr. 18	Apr. 19
6 A.M.	29	46	58	31	67
Noon	18	24	16	17	14
6 P.M.	19	20	14	13	14
Average	22	25	29	20	31

Temperature in Degrees Fahrenheit

	Apr. 15	Apr. 16	Apr. 17	Apr. 18	Apr. 19
Maximum	90	82	81	86	92
Minimum	63	58	55	52	53
Mean	76	70	68	69	72

Barometric Pressure in Centimeters

Time	Apr. 15	Apr. 16	Apr. 17	Apr. 18	Apr. 19
6 A.M.	29.92	29.93	29.81	29.88	29.88
6 P.M.	29.86	29.77	29.78	29.83	29.80

Wind Velocity in Miles per Hour

	Apr. 15	Apr. 16	Apr. 17	Apr. 18	Apr. 19
Direction	W	W	N	N	E
Max. Velocity	21	18	21	18	9

honor roll most of the three years previous. The records of this student are in Table I from February 11 to and including March 1. Student No. 1 was a freshman girl who was a poor student and not much interested in any thing but having a good time altho she had the ability to make a good record. The records of this student are found in Table I from March 4 to and including March 22. Student No. 32 was a freshman boy who was an average student and was very anxious to make good grades but lacked the ability. Table I contains his record from March 25 to and including April 12.

Following are the graphs and the results of the calculations for the three students.

TABLE II CORRELATIONS OF STUDENT NO. 19 WITH HUMIDITY, TEMPERATURE, WIND VELOCITY AND BAROMETRIC PRESSURE.

Per cent of study time and humidity .....r	equals	- .038
Per cent of study time and temperature ....r	"	.103
Per cent of study time and wind velocity ..r	"	- .199
Per cent of study time and barometric pressure r	"	.17

Graph No. 1 for student No. 19 is found on page 24.

TABLE III CORRELATIONS OF STUDENT NO. 1 WITH HUMIDITY, TEMPERATURE, WIND VELOCITY AND BAROMETRIC PRESSURE

Per cent of study time and humidity .....r	equals	.30
Per cent of study time and temperature .....r	"	-.009
Per cent of study time and wind velocity .....r	"	-.048
Per cent of study time and barometric pressure r	"	.024

Graph No. 2 for student No. 1 is found on page 25.

TABLE IV CORRELATIONS OF STUDENT NO. 32 WITH HUMIDITY, TEMPERATURE, WIND VELOCITY AND BAROMETRIC PRESSURE

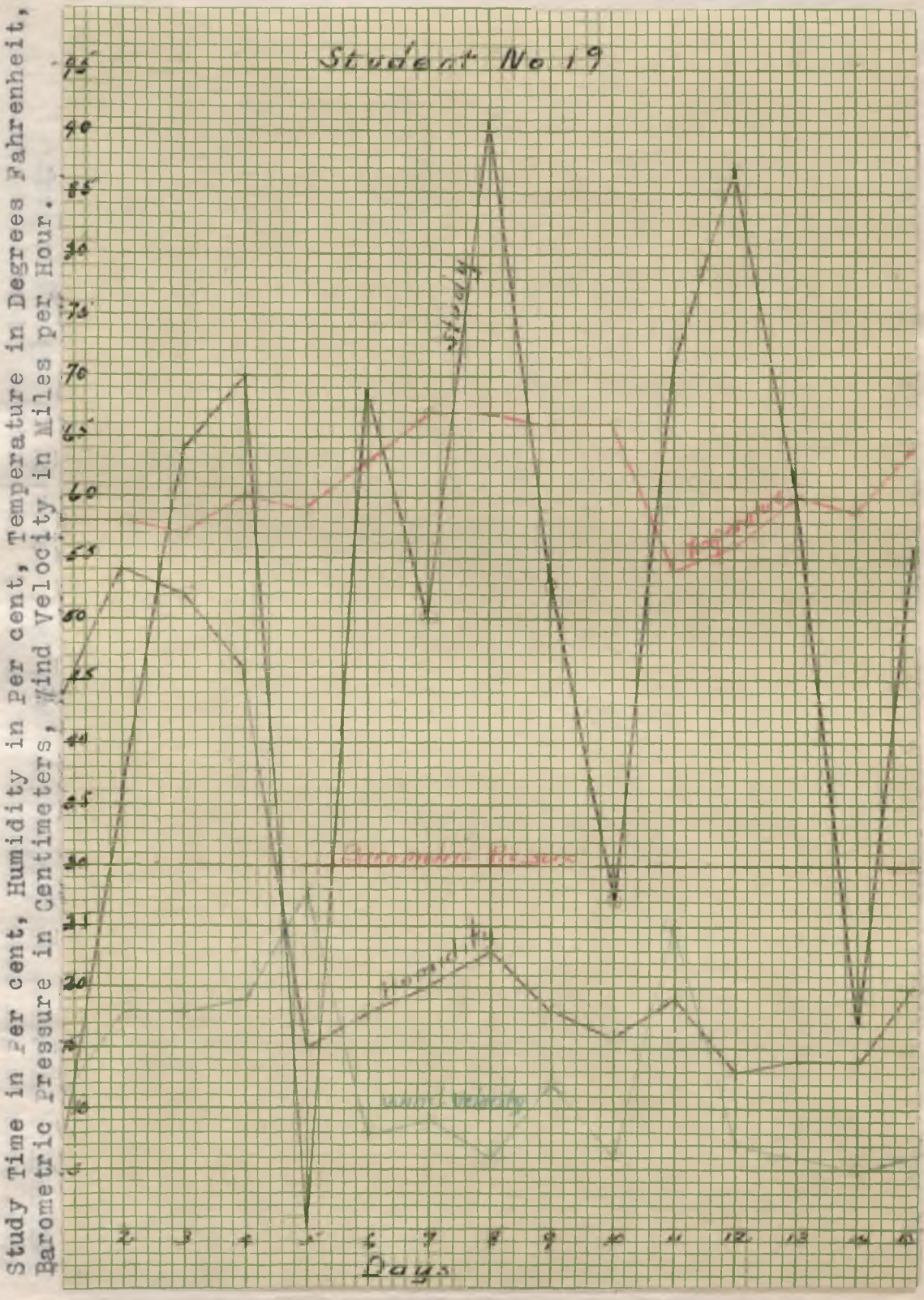
Per cent of study time and humidity	r equals	.214
Per cent of study time and temperature	r "	-.016
Per cent of study time and wind velocity ...	r "	.062
Per cent of study time and barometric pressure	r "	.255

Graph No. 3 for student No. 32 is found on page 26.

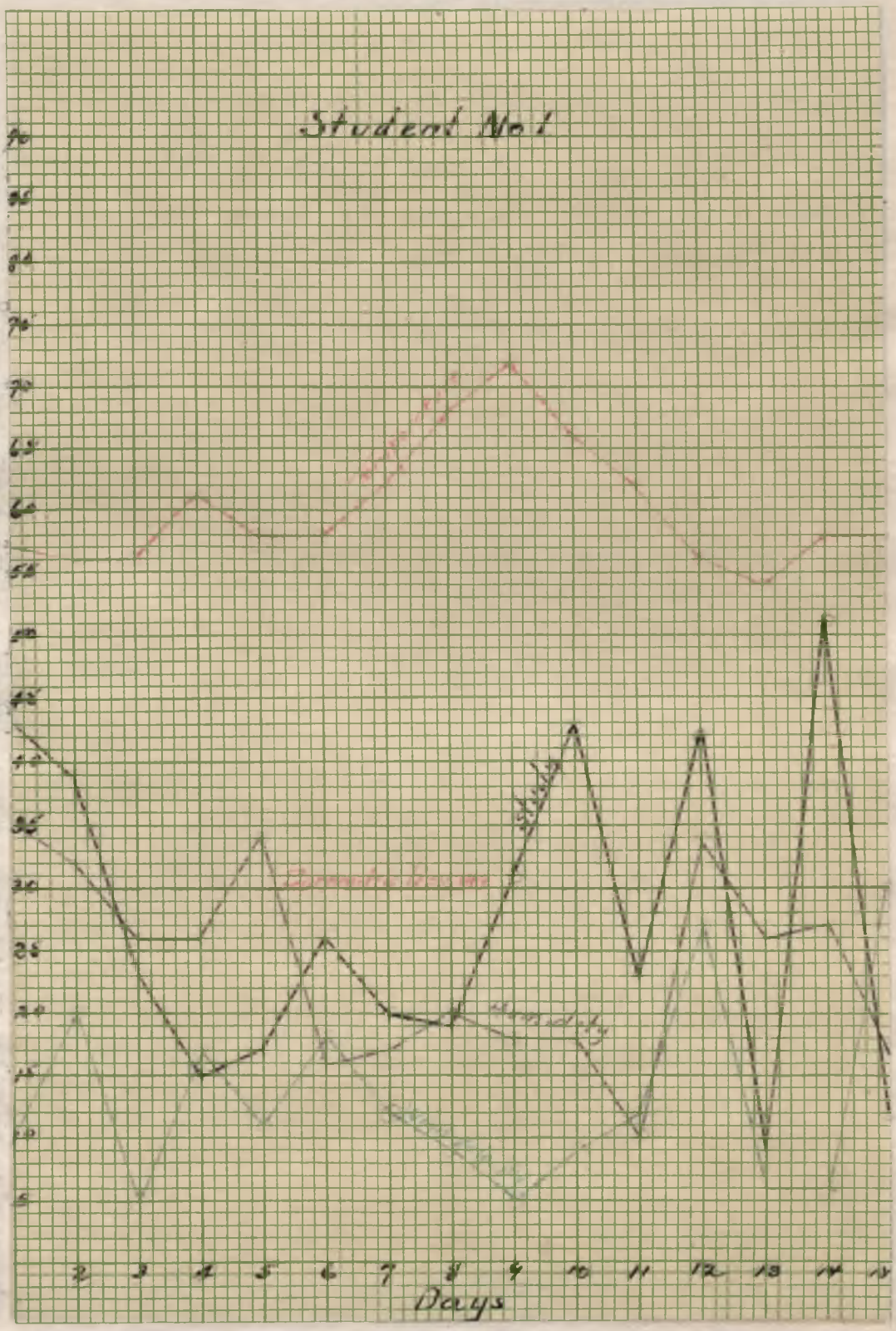
An examination of the graph of student number nineteen, showing per cent of observed period actually devoted to study and the weather curves, shows no relation, which indicates that weather does not effect the sustained attention of this student. The correlations made with this student's records are so low that they also indicate that weather does not effect this student's ability for sustained attention.

The graph (No. 2) made of student number one showing the per cent of observed period actually devoted to study and the four weather factors disclose no relation between the curves. The correlation between the per cent of observed period actually devoted to study and humidity is .30 $\pm$ .159. To be reasonably sure that there is a positive correlation present an obtained r should be at least four times its P. E. The P. E. in this case when r equals .30 is .159 a and four times the P. E. of r is .64, consequently, the conclusion can be drawn that the correlation is not reliably positive.

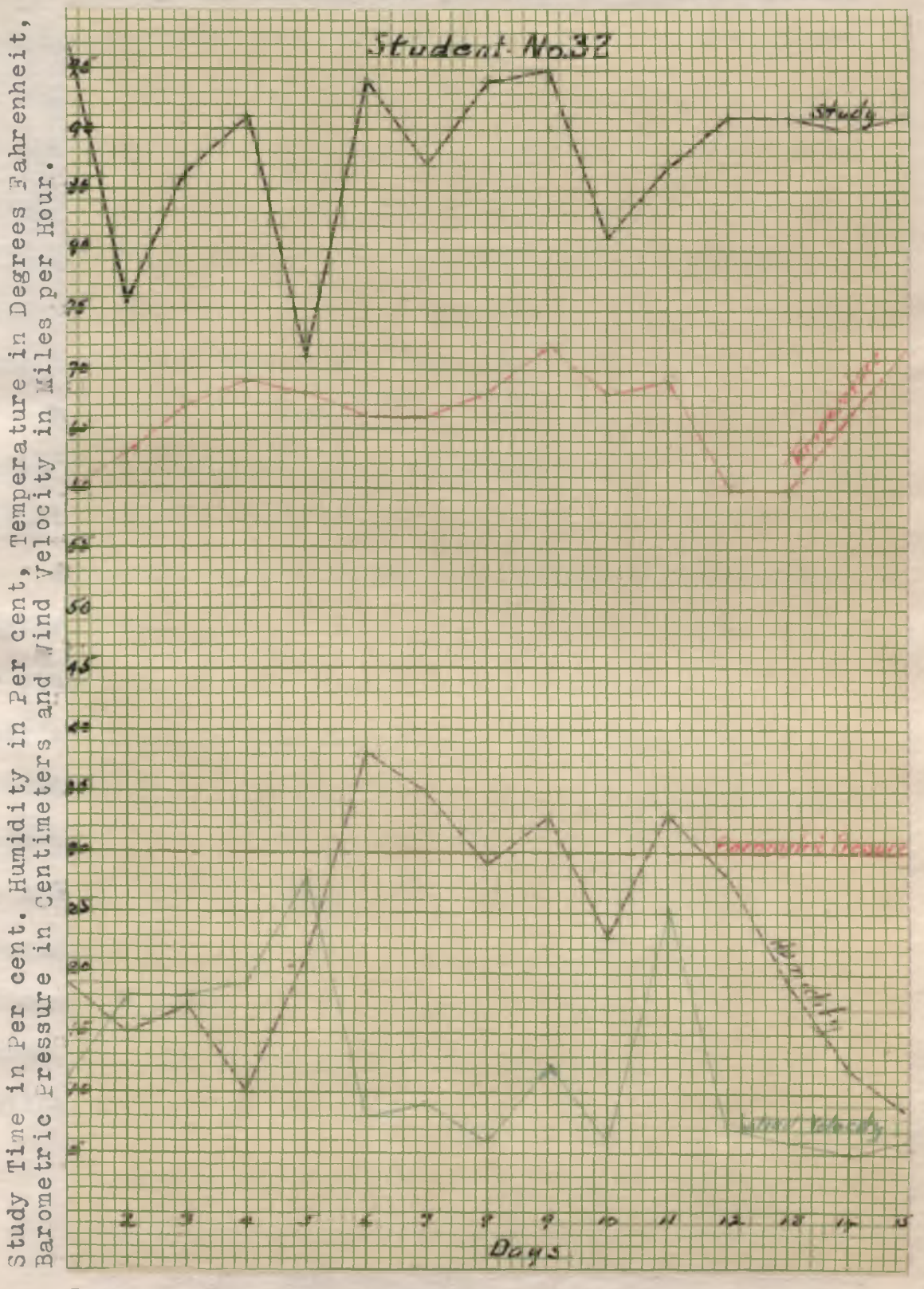
An examination of graph (No. 3) made of student



Graph 1. Per Cent of Observed Study Time, Humidity, Temperature, Barometric Pressure and Wind Velocity



Graph 2. Per Cent of Observed Study Time, Humidity, Temperature, Barometric Pressure and Wind Velocity



Graph 3. Per Cent of Observed Study Time, Humidity, Temperature, Barometric Pressure and Wind Velocity

number thirty-two showing the per cent of observed period actually devoted to study and the weather curves shows no relationship. The correlations between the per cent of observed period actually devoted to study and the weather factors are so small that they are not reliable. This conclusion is made because the r's are less than .30 which was proven to be unreliable in the calculations of student No. 1.

From the above information, the conclusion can be drawn that the weather does not effect the sustained attention of these students.

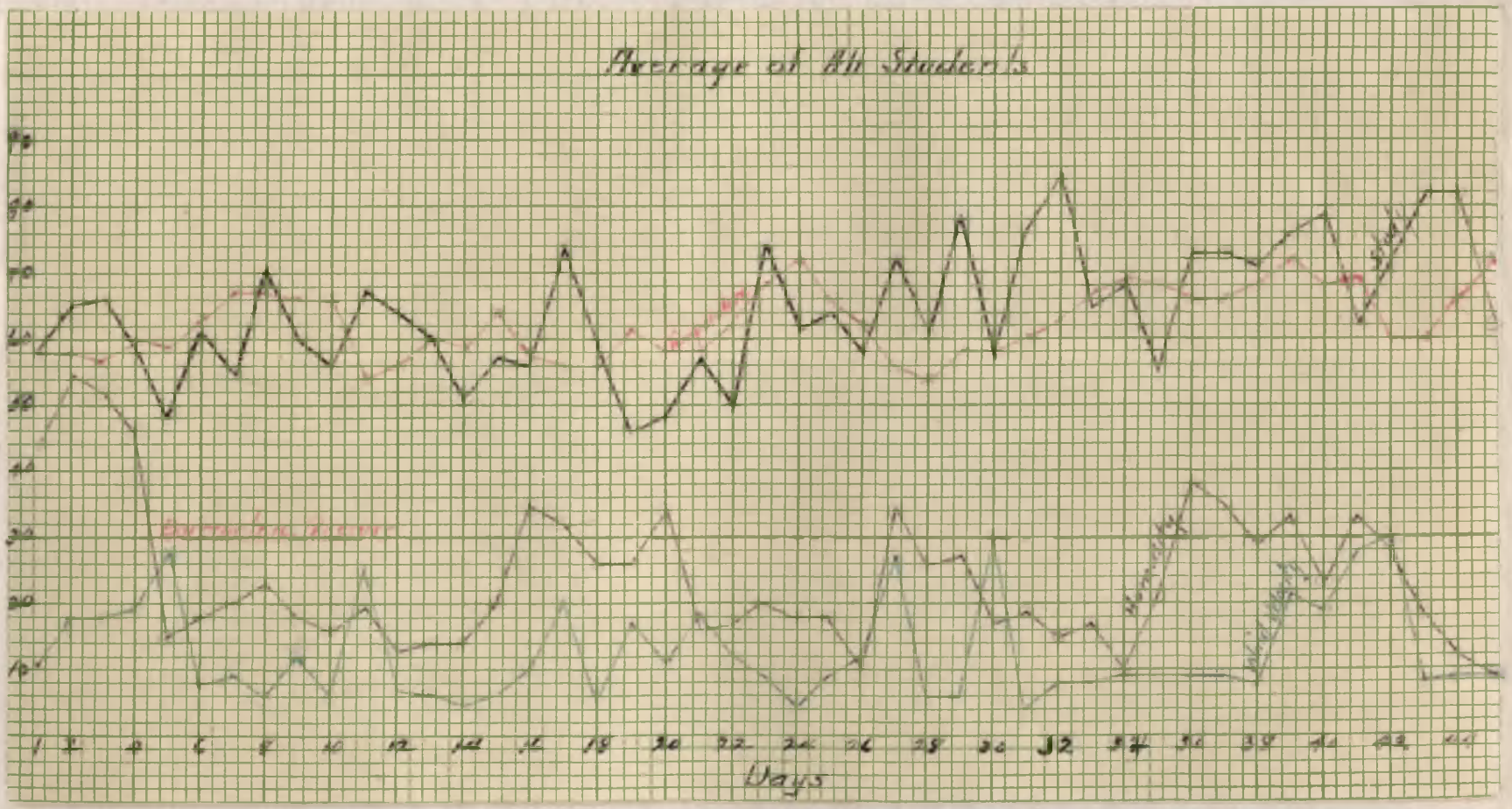
Since there were a number of records made for each day of the per cent of the observed period actually devoted to study, the average of these records should give a fair sampling of the per cent of time all students in a study hall devote to study. The largest number of records for one day from which the average is computed is 12 and the smallest number for one day from which the average is computed is seven. These averages are for 45 continuous school days starting February 2 and ending March 12. The calculations and graph using these averages follow.

TABLE V CORRELATION OF AVERAGE OF ALL STUDENTS WITH HUMIDITY, TEMPERATURE, WIND VELOCITY, AND BAROMETRIC PRESSURE

Per cent of study time and humidity .....r equals	.019
Per cent of study time and temperature .....r "	.19
Per cent of study time and wind velocity ...r "	-.029
Per cent of study time and barometric pressure r "	-.14

Graph No. 4 for the average of all students is found on page 29.

No relationship can be seen between the curve of the per cent of the average of the observed period actually devoted to study and the weather curves in graph No. 4. The highest correlation is between the per cent of study time and temperature which is .19. In order for the correlation to be reliable the r must be at least 4 times the P. E. of r. In this case the P. E. is .064 and 4 times the P. E. of r is .256. Since the r is only .19 and 4 times the P. E. is .256, the conclusion can be drawn that weather conditions do not have any effect on the sustained attention of this group.



Graph 4. Per Cent of Observed Study Period, Humidity, Temperature, Barometric Pressure and Wind Velocity.
Vertical is: Per cent of study time in per cent, Humidity in per cent, Temperature in degrees Fahrenheit, Barometric pressure in centimeters and Wind velocity in miles per hour.

CHAPTER III

CONCLUSIONS

From the examination of graphs 1, 2 and 3, which give the curves of the per cent of the observed period actually devoted to study of the three representative students and the weather curves, the conclusion can be drawn that there is no definite relationship between the variables. Also from an examination of graph 4, which gives the curve of the per cent of the observed period actually devoted to study of the averages of all the students and weather curve, there is found no relationship.

The largest correlation in any of the calculations between the per cent of observed period actually devoted to study of the three representative students and the weather factors is found in the calculations of student No. 1. The correlation of .30 is between the per cent of study time and humidity. In order to be sure that the correlation is reliable, it should be at least 4 times the P. E. of r. Since 4 times the P. E. of r in this case is .64 the correlation is not reliable.

The largest correlation of the averages of all the students' per cent of observed period actually devoted to study is .19. The P. E. of r is .064 and 4 times the P. E. of r is .256 which shows that this correlation is

not reliable.

The conclusions are, since there is no definite relationship shown in the graphs and the correlations are not reliable, that so far as this study goes, no factor of the weather has any effect on the sustained attention of students in the study hall.

Limitations of the Study.

This study did not take into consideration that weather may effect the disciplinary problems that may arise from weather conditions. It is possible that weather may effect the nervous stability of adults, including the teacher in the school, Consequently, the adults may project their own feelings into their reactions toward students, thus causing disciplinary troubles with them which may be indirectly due to weather conditions.

In the south western part of the United States at the time of year that this study was made, there are no extremes in temperature. The relative humidity decreases as the days get very warm, consequently, until the temperature gets extreme there possibly is no student reactions to weather conditions.

There is a possibility that the amount of static electricity in the air may effect the nervous stability of students and teachers and thus cause disciplinary troubles. The direction of the wind or the amount of

static electricity in the air was not taken into account in this study. It would be interesting to see the results from an objective study in which a method of measuring static electricity in the air was devised and used to find the possible effect of this factor upon student behavior.

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