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A normative study of students selected at random on the H.M.H. plus and minus binocular rock test

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Abstract

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Thesis

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A NORMATIVE STUDY
OF STUDENTS SELECTED AT RANDOM
ON THE H.M.H. PLUS AND MINUS BINOCULAR ROCK TEST.

A THESIS
PRESENTED TO THE FACULTY
OF
PACIFIC UNIVERSITY

BY
DONALD J. MILNE
ROBERT M. SMALL
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IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE
DOCTOR OF OPTOMETRY

JUNE 1961

DEDICATION

This thesis is dedicated to the future students of Pacific University's College of Optometry for their use clinically and for the continued advancement of the profession.

We would also like to recognize Harold M. Haynes, O.D., for the help and guidance given during this research.

DJM, DET, RMS.

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STATEMENT OF PROBLEM

This paper represents a normative study of the H. M. H. Plus and Minus Binocular Rock test. The H. M. H. test is a clinical reaction time test for measuring relative accommodative facility.

EXPERIMENTAL PROCEDURE

One hundred and twenty subjects were tested. These subjects fall within the age range of 16 to 35 years and were selected at random from the Pacific University Campus. Of the 120 subjects given the test, 64 were females and 58 were males. All Optometry students and individuals having had visual training within the previous six months were excluded from this study. Also excluded were those unable to clear and single the 20/20 line of the reduced snellen target through their habitual distance Rx.

EQUIPMENT

The equipment consisted of a Keystone Van Orden Flipper, one reduced snellen chart, one pair +2.00 lenses, one pair -2.00 lenses, a stop watch, a Wirt Stereo testing target, one pair polaroid glasses, and a uniform beige colored background measuring 2 ft. by 4 ft.

TESTING PROCEDURE

1. Patients were given the Wirt Stereo Test through their distant Rx. and the percentage of stereopsis was recorded. This test was taken at 16 inches.
2. The shaft setting on the Van Orden Flipper was set at 16 inches.
3. The near P.D. was taken on each patient and the instrument was set accordingly.
4. The subject's distant Rx was worn and through this he was required to have binocularity as determined by the Wirt Stereo. It was also necessary that the subject read the 20/20 line of the reduced snellen target through the plus and minus of the testing sequence.
5. The instructions for the testing was then given and demonstrated to the subject. (See instructions, page 5.)
6. The stimulus sequence was from plano to +2.00 to plano and from plano to -2.00 to plano, which represents one cycle.
7. The order of stimulation was varied alternately from subject to subject, one being given plus first and the next given minus first.
8. The rock was maintained for 2 minutes. The cycles were recorded after 30, 60, 90, and 120 seconds.

INSTRUCTIONS

1. "How many charts do you see?" (If one, proceed)
2. "Can you read all the letters in the bottom row?"
3. "Read the letters aloud to me."
4. "Flip the lenses into place."
5. "How many charts do you see?"
6. "If one chart is reported, ask, "Did you see two charts before you saw one?"
7. "Can you read all the letters in the bottom line?" (Optional: Ask for oral reading of letters if deemed necessary.)
8. "The purpose of this test is to see how many times a minute you can flip the lenses in and out while keeping the bottom line clear."
9. "As soon after each flip as you can see all the letters clear on the bottom line, flip the lenses again."
10. "Try to flip the lenses as rapidly as possible but, remember, do not flip the lenses until after you can see one chart and can clear all the letters on the bottom line."
11. "Continue flipping the lenses until you are told to stop."

RESULTS

There were 120 subjects given the test, with a total of 102 successfully completing the 2 minute periods of both phases. Of the 18 who failed, 6 could not clear the 20/20 line through their habitual distant Rx. There were 3 who gave tropic responses in the form of diplopia or high suppression, the suppression being noted in low stereopsis with the Wirt Stereo. During the plus phase, five subjects were unable to clear the 20/20 line and one was unable to single the target. During the minus phase, two subjects were unable to clear the 20/20 line and one was unable to single the target. Of the 18 failures, zero stereopsis was found on only two, the remaining 16 scored 80% or more stereopsis.

Table I shows the mean, mode, median, and standard deviation of the frequency distribution of responses during the 30, 60, 90, and 120 seconds of the plus phase.

Table II shows the mean, mode, median, and standard deviation of the frequency distribution of responses during the 30, 60, 90, and 120 seconds of the minus phase.

Table III shows a comparison of the first and second minute of the plus phase for each subject.

Table IV shows a comparison of the first and second minute of the minus phase for each subject.

Graph I gives the comparison of the means and standard deviations as a function of time on the plus phase.

Graph II gives the comparison of the means and standard deviations as function of time on the minus phase.

Scattergram I shows the correlation and correlation coefficient of the first minute as compared to the second minute of the plus phase.

Scattergram II shows the correlation and correlation coefficient of the first minute as compared to the second minute of the minus phase.

Scattergram III shows the relationship and correlation coefficient of the first minute on the plus phase as compared to the first minute on the minus phase.

All data is recorded in cycles per minute, or cycles per thirty seconds as indicated.

SUMMARY

A sample of 120 college students selected at random were used to study their reactions to the H. M. H. Plus and Minus Binocular Rock Test. A graphical and statistical analysis of the data is presented.

TABLE I

Frequency Distribution of Responses on the Plus Phase for 30, 60, 90 and 120 seconds.

	30	60	90	120
28.00-29.99	0	0	1	1
26.00-27.99	0	1	1	1
24.00-25.99	2	2	2	1
22.00-23.99	0	1	1	3
20.00-21.99	1	2	3	3
18.00-19.99	4	4	6	3
16.00-17.99	2	2	3	10
14.00-15.99	8	6	4	4
12.00-13.99	12	17	14	13
10.00-11.99	17	13	17	16
8.00- 9.99	19	20	23	20
6.00- 7.99	22	20	14	15
4.00- 5.99	11	9	8	5
2.00- 3.99	4	5	5	7
0.00- 1.99	0	0	0	0
TOTAL	102	102	102	102
MEAN	10.16	10.65	11.23	12.76
MODE	7	8	9	9
MEDIAN	11.50	9.70	11.50	10.50
SIGMA	4.75	4.90	5.38	5.54
MEAN FIRST MIN.		20.81		
MEAN SECOND MIN.				23.99

TABLE II

Frequency Distribution of Responses on the Minus Phase for 30, 60, 90 and 120 seconds.

	30 sec.	60 sec.	90 sec.	120 sec.
28.00-29.99	0	0	0	1
26.00-27.99	0	0	0	0
24.00-25.99	1	3	0	1
22.00-23.99	1	0	3	2
20.00-21.99	2	1	1	2
18.00-19.99	0	4	1	3
16.00-17.99	6	5	10	11
14.00-15.99	11	11	9	13
12.00-13.99	12	11	19	12
10.00-11.99	31	27	21	16
8.00-9.99	14	16	18	19
6.00-7.99	11	17	11	11
4.00-5.99	12	5	3	5
2.00-3.99	1	1	3	4
0.00-1.99	0	1	1	0
TOTAL	102	102	102	102
MEAN	10.08	11.31	11.43	12.12
MODE	11.00	11.00	11.00	9.00
MEDIAN	11.00	11.70	11.00	11.50
SIGMA	4.09	4.34	4.13	4.98
MEAN FIRST MIN.		21.39		
MEAN SECOND MIN.				23.55

TABLE III

Change of Response on the Plus Phase

20	
19	
18	
17	XX
16	X
15	X
14	X
13	
12	
11	
+ 10	
9	XX
8	
7	XXX
6	XXXXX
5	XX
4	XXXXX
3	XXXXXXXXXX
2	XXXXXXXXXXXXXXXXXX
0	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
2	XXXXXXXXXXXXX
3	XXX
4	XX
5	X
6	
7	X
8	X
9	
- 10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Comparison of the change in response from the first minute to the second minute. Plus indicates an increased number of responses. Minus indicates a decreased number of responses. Zero, plus or minus one, is considered no change in response.

TABLE IV

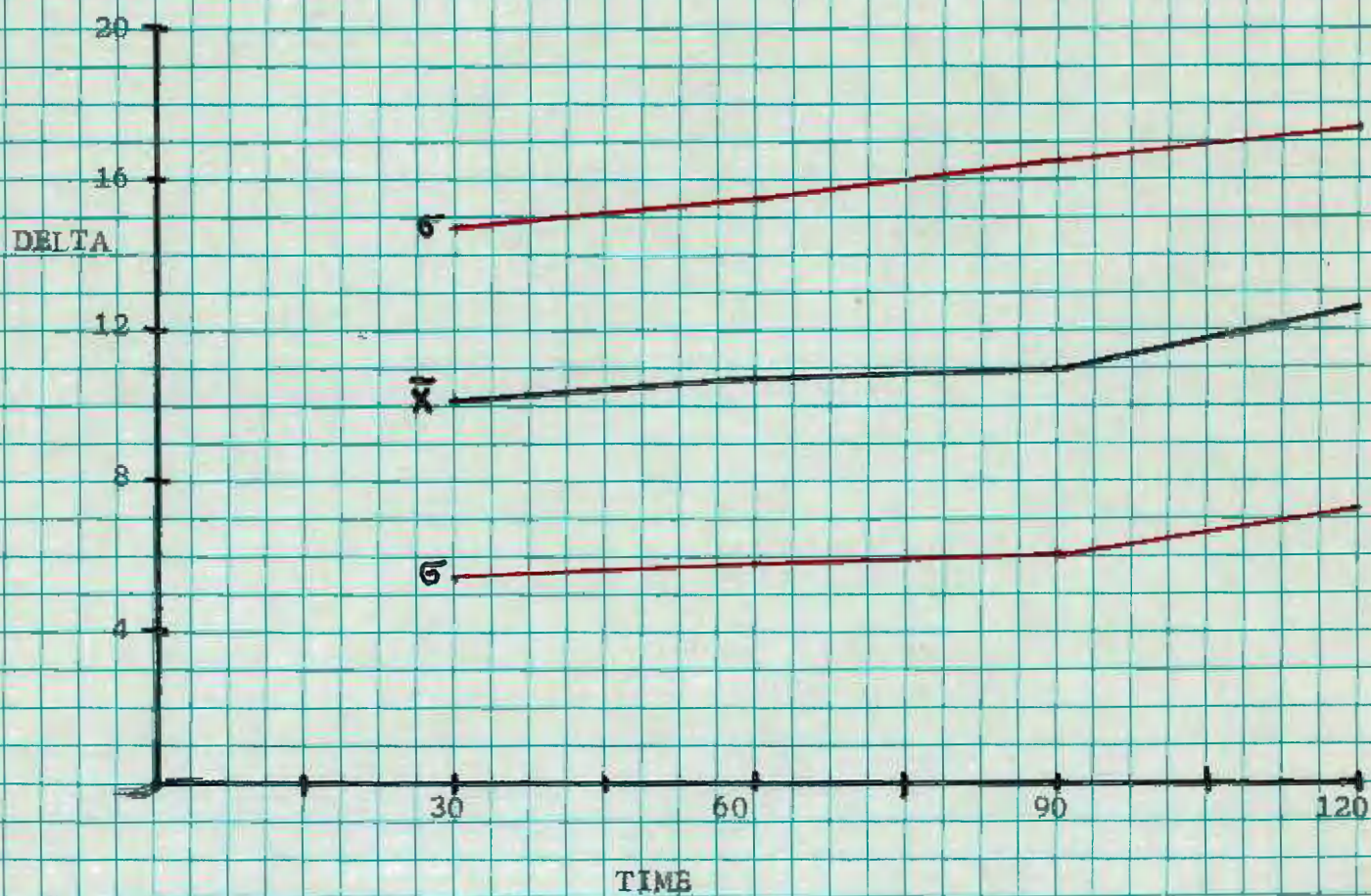
Change of response on the Minus Phase

20	
19	
18	
17	
16	X
15	X
14	
13	
12	
11	
+ 10	
9	XXX
8	
7	XXX
6	XXXXX
5	XXXX
4	XXXX
3	XXXXXXXX
2	XXXXXXXXXXXX
0	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
2	XXXXXX
3	XXXXX
4	XXXX
5	
6	XX
7	X
8	
9	
- 10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Comparison of change in the response from the first minute to the second minute. Plus indicates an increased number of responses. Minus indicates a decreased number of responses. Zero, plus or minus one, is considered no change in response.

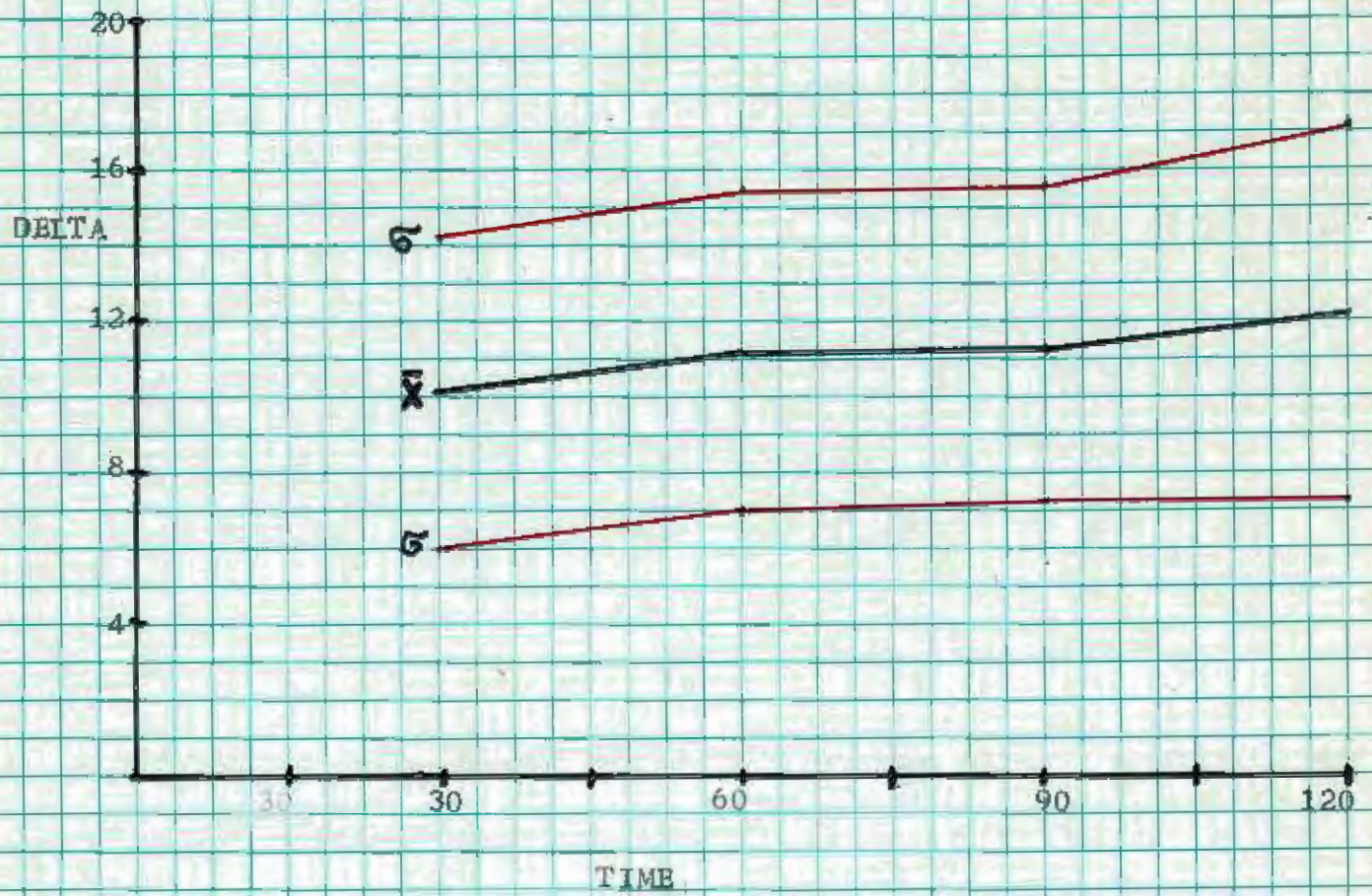
GRAPH I

COMPARISON OF THE MEANS AND STANDARD DEVIATIONS
AS A FUNCTION OF THE TIME ON THE PLUS PHASE.



GRAPH II

COMPARISON OF THE MEANS AND STANDARD DEVIATIONS
AS A FUNCTION OF THE TIME ON THE MINUS PHASE.



SCATTERGRAM III FOR CORRELATION OF PLUS PHASE TO MINUS PHASE

50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0	FIRST MINUTE PLUS		FIRST MINUTE MINUS		f	fy'	fy' ²	Ex'y'	y' ²	Ex'y' ²	11086
1	1	1	1	1	1	25	625	24	24	600	11086
1	1	1	1	1	1	24	576	16	16	584	11086
1	1	1	1	1	1	23	529	9	9	549	11086
1	1	1	1	1	1	22	484	4	4	500	11086
1	1	1	1	1	1	21	441	1	1	460	11086
1	1	1	1	1	1	20	400	0	0	400	11086
1	1	1	1	1	1	19	361	-1	1	352	11086
1	1	1	1	1	1	18	324	-2	4	312	11086
1	1	1	1	1	1	17	289	-3	9	270	11086
1	1	1	1	1	1	16	256	-4	16	220	11086
1	1	1	1	1	1	15	225	-5	25	170	11086
1	1	1	1	1	1	14	196	-6	36	120	11086
1	1	1	1	1	1	13	169	-7	49	70	11086
1	1	1	1	1	1	12	144	-8	64	20	11086
1	1	1	1	1	1	11	121	-9	81	-30	11086
1	1	1	1	1	1	10	100	-10	100	-100	11086
1	1	1	1	1	1	9	81	-11	121	-198	11086
1	1	1	1	1	1	8	64	-12	144	-288	11086
1	1	1	1	1	1	7	49	-13	169	-378	11086
1	1	1	1	1	1	6	36	-14	196	-468	11086
1	1	1	1	1	1	5	25	-15	225	-555	11086
1	1	1	1	1	1	4	16	-16	256	-640	11086
1	1	1	1	1	1	3	9	-17	289	-723	11086
1	1	1	1	1	1	2	4	-18	324	-800	11086
1	1	1	1	1	1	1	1	-19	361	-871	11086
1	1	1	1	1	1	0	0	-20	400	-936	11086
1	1	1	1	1	1	-1	-1	-21	441	-995	11086
1	1	1	1	1	1	-2	4	-22	484	-1048	11086
1	1	1	1	1	1	-3	9	-23	529	-1095	11086
1	1	1	1	1	1	-4	16	-24	576	-1136	11086
1	1	1	1	1	1	-5	25	-25	625	-1169	11086
1	1	1	1	1	1	-6	36	-26	676	-1196	11086
1	1	1	1	1	1	-7	49	-27	729	-1217	11086
1	1	1	1	1	1	-8	64	-28	784	-1232	11086
1	1	1	1	1	1	-9	81	-29	841	-1242	11086
1	1	1	1	1	1	-10	100	-30	900	-1248	11086
1	1	1	1	1	1	-11	121	-31	961	-1251	11086
1	1	1	1	1	1	-12	144	-32	1024	-1250	11086
1	1	1	1	1	1	-13	169	-33	1089	-1245	11086
1	1	1	1	1	1	-14	196	-34	1164	-1236	11086
1	1	1	1	1	1	-15	225	-35	1250	-1222	11086
1	1	1	1	1	1	-16	256	-36	1344	-1204	11086
1	1	1	1	1	1	-17	289	-37	1450	-1182	11086
1	1	1	1	1	1	-18	324	-38	1560	-1156	11086
1	1	1	1	1	1	-19	361	-39	1680	-1126	11086
1	1	1	1	1	1	-20	400	-40	1810	-1092	11086
1	1	1	1	1	1	-21	441	-41	1950	-1054	11086
1	1	1	1	1	1	-22	484	-42	2100	-1012	11086
1	1	1	1	1	1	-23	529	-43	2260	-966	11086
1	1	1	1	1	1	-24	576	-44	2430	-916	11086
1	1	1	1	1	1	-25	625	-45	2610	-862	11086