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## Differential phoria analysis using varied targets

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## Differential phoria analysis using varied targets

### Abstract

It has long been a source of discussion concerning phoria, as to which target gives the best phoric measurement and how the phorias taken with different targets compare. In addition, much discussion has been set forth concerning what effect an accommodative control has on the phoria. It is toward this that we direct our study of the effect of varied targets on the phoric measurement.

### Degree Type

Thesis

### Degree Name

Master of Science in Vision Science

### Committee Chair

Carol B. Pratt

### Subject Categories

Optometry

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DIFFERENTIAL PHORIA ANALYSIS  
USING VARIED TARGETS

Presented by:

William Austin  
Robert F. Beaderstadt  
Ronald Stickle  
Glenn Wilson

To the faculty and College of Optometry, Pacific  
University, Forest Grove, Oregon.

May - 1959

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The authors are greatly indebted to Dr. Carol B. Pratt for his inspiration and many helpful suggestions in making this thesis possible.

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**Problem:**

It has long been a source of discussion concerning phoria, as to which target gives the best phoric measurement and how the phorias taken with different targets compare. In addition, much discussion has been set forth concerning what effect an accommodative control has on the phoria.

It is toward this that we direct our study of the effect of varied targets on the phoric measurement.

### Procedure:

Three different targets were used to gather the data for this thesis. As a control, a reduced Snellen card for 16" was used, and phorias taken with it. Next, a gradient density card was used. This is a target with no definite border. The purpose behind this was twofold. First, to allow the observer no boundaries which he could align the image seen diplopically. Next, it would allow a somewhat less accommodative control than the Snellen or the uniform density card. The latter is a rectangular block with sharp borders and with a composition that would allow an accommodative demand. All findings were taken at 16". The targets were on large 8½ by 11" paper, so that the borders seen with the normally small card would not interfere with the testing conditions and supply a fusional demand. Next, so that the prongs of the card holder would not be seen in the field, a special holder was attached on the posterior side of the card. Copies of all three targets are supplied on the last several sheets of this report.

The findings were taken with a Green's phoropter with illumination of 20 f.c. The control used was the patient's #7A, 7A - 1.00 and 7A plus 1.00, in that order.

With each target in place, a total of four phorias were taken, the last three being recorded; the initial one used only as a trial to determine the approximate location. After the approximate phoria was found, the prisms were removed and instructions given. Upon insertion of the prisms again, phorias were taken from base in to base out, base out to base in, and base in to base out at five second intervals, without stopping or attempting to regain binocular vision.

The order of the targets used was first the Snellen, followed by the uniform density, and last, the gradient density with lenses in place as described above. Each of the targets being run through the control, the plus 1.00 and the minus 1.00 sequence.

The instructions given the patient on viewing the reduced Snellen target were as follows: "Looking at the bottom line of the upper group of letters, tell me when the bottom group passes directly beneath it." The instructions on the other two targets were as follows: "Looking at the top object tell me when the bottom one passes directly beneath it".

Sample Calculation Formula -

$$s = \frac{X_3 - X_1}{T_3 - T_1}$$

$X_1$  = 1st Phoria Measurement

$X_2$  = 2nd

$X_3$  = 3rd

$T_1$  = Time of  $X_1$

$T_2$  = " "  $X_2$

$T_3$  = " "  $X_3$

To arrive at average phoria for 10 seconds

$$F = \frac{2X_2 + X_1 + X_3}{4} + s \left( 10 - \frac{2T_2 + T_1 + T_3}{4} \right)$$



AVERAGE F VALUES

	<u>Snellen</u>	<u>Uniform</u>	<u>Gradient</u>
Habitual	6.0	6.0	7.6
-1.00	2.2	2.2	2.5
+1.00	7.3	7.8	7.7

NAME \_\_\_\_\_

AGE \_\_\_\_\_

Average Values

DATE \_\_\_\_\_

TIME \_\_\_\_\_

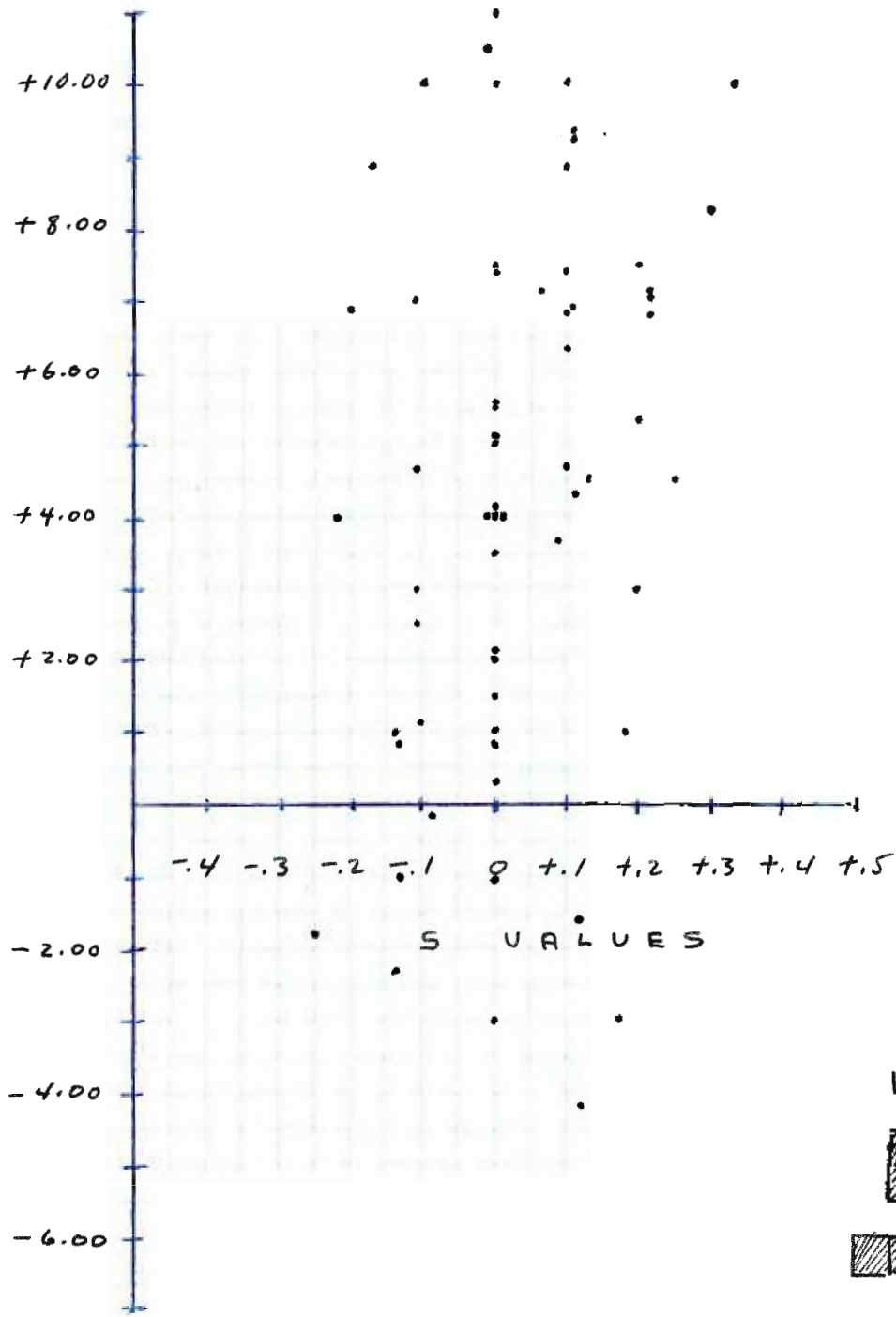
HABITUAL AT NEAR \_\_\_\_\_

HABITUAL	REDUCED	SNELLEN	UNIFORM	DENSITY	GRADIENT	DENSITY
	EXO	SEC	EXO	SEC	EXO	SEC
	5.27	4.41	5.00	4.54	5.80	4.00
	5.25	9.00	5.30	9.00	5.66	8.50
	5.80	13.60	5.65	13.50	6.17	12.50
	5.97	0.58	5.98	0.73	7.64	0.44
	"F"	"A"	"F"	"A"	"F"	"A"

- 1.00	REDUCED	SNELLEN	UNIFORM	DENSITY	GRADIENT	DENSITY
	EXO	SEC	EXO	SEC	EXO	SEC
	1.80	4.84	2.36	4.50	2.76	4.42
	2.05	9.45	2.08	9.35	2.76	9.20
	2.16	14.30	2.20	14.20	2.58	13.50
	2.22	0.38	2.16	-0.17	2.53	-0.20

+ 1.00	REDUCED	SNELLEN	UNIFORM	DENSITY	GRADIENT	DENSITY
	EXO	SEC	EXO	SEC	EXO	SEC
	6.95	4.77	6.90	4.59	7.40	4.41
	7.00	9.43	7.14	8.20	7.25	9.16
	7.43	14.53	7.40	14.30	7.75	14.20
	7.3	0.49	7.75	0.52	7.69	0.36

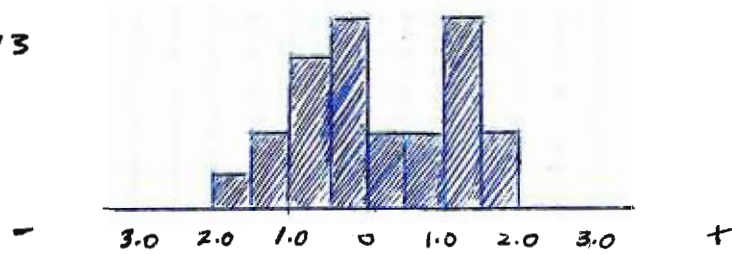
U P E C T P



SCATTERGRAM:  
SNELLEN VALUES ONLY

MEAN = + 0.13

$\sigma = 0.79$

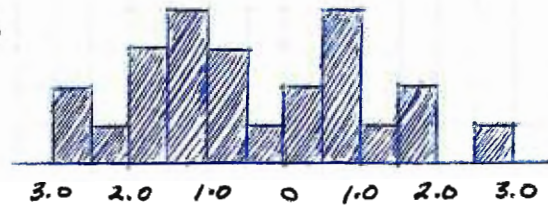


FSN - FUN

HABITUAL

MEAN = - 0.50

$\sigma = 1.05$

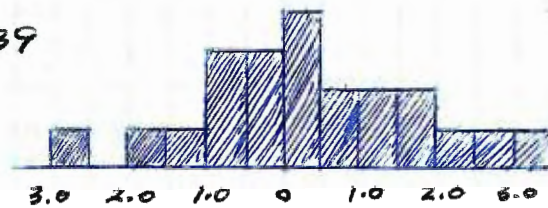


FSN - FGRAD

HABITUAL

MEAN = + 0.39

$\sigma = 0.83$

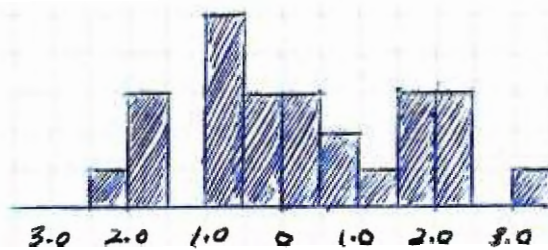


FSN - FUN

-1.00

MEAN = + 0.26

$\sigma = 0.69$

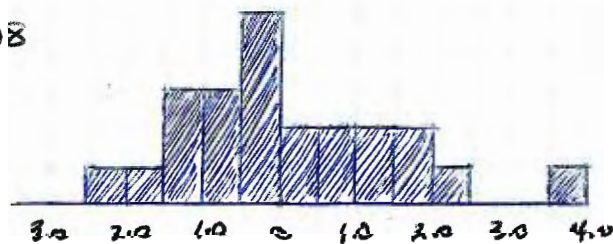


FSN - FGRAD

-1.00

MEAN = + 0.08

$\sigma = 0.86$

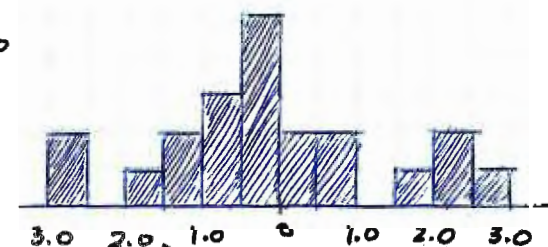


FSN - FUN

+1.00

MEAN = - 0.16

$\sigma = 0.99$



FSN - FGRAD

+1.00

AVERAGE F VALUES AT TEN SECONDS CALCULATED FROM AN AVERAGE S VALUE:

	SNELLEN	UNIFORM	GRADIENT
HABITUAL	5.74	5.66	6.42
MINUS 1.00	2.25	2.42	3.06
PLUS 1.00	7.30	7.50	7.65

When considering the average F values for 10 inches the following average accommodative-convergence relationships may be calculated.

- a. Reduced Snellen            2.53 prism diopters to 1.00 D
- b. Uniform Density            2.54 prism diopters to 1.00 D
- c. Gradient Density            2.30 prism diopters to 1.00 D

Conclusion:

On the average in these experiments there is no difference in the average ACA for a target of reduced Snellen as compared to a target of uniform density. However, the ACA for the gradient density was 10% less than that obtained with the other two.