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Abstract

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Hannu R. V. Laukkanen

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THE PREVALENCE OF VISUAL ANOMALIES AMONG ADULT OFFENDERS

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Advisors:

Dr. Hannu R. V. Laukkanen
Dr. Robert P. Rosenow

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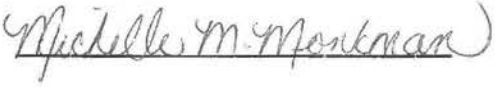
Michelle M. Monkman 

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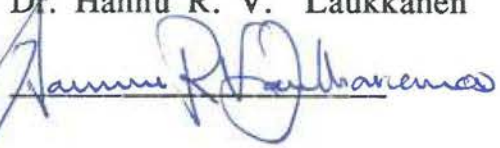
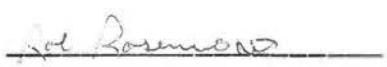
Dr. Hannu R. V. Laukkanen 

Dr. Robert P. Rosenow 

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BIOGRAPHICAL SKETCHES

Colleen D. Gill attended the University of Saskatchewan in Saskatoon, Saskatchewan and received her Bachelor of Science degree with a Major in Anatomy. She has attended Pacific University College of Optometry and will receive her Doctor of Optometry degree in May 1992.

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ABSTRACT

Fifty-three incarcerated adult sexual offenders from a voluntary treatment program at the Oregon State Correctional Facility were screened for visual anomalies. Subjects were divided into two groups based on intellectual function, one a higher functioning (HF) group, and one a social skills (SS) group. The two groups were compared based on a screening battery probing ocular health, eye movement skills, visual perceptual abilities and accommodative/vergence abilities. The ocular health did not differ between the two groups or from the general population. Differences were found in visual perceptual function between the high and low functioning groups. The HF group outperformed the lower on all perceptual and eye movement tests except the subjective eye movement evaluation. Unexpected differences were found between the two groups in the areas of accommodative posture, vergence facility, and distance monocular acuities.

KEY WORDS: juvenile delinquency, recidivism, learning disabilities, adult offenders, vision screening

INTRODUCTION

The incidence of juvenile delinquency is on the rise in this country, and many studies have been done to determine the best way to help these youths. Much of the research has focused on learning disabilities as they relate to juvenile delinquency and its causes. Some of the research studies have attempted to link vision problems and learning disabilities with juvenile delinquency (1-9).

What percentage of the juvenile delinquent population has vision problems? Six studies since 1966 have shown varying rates of prevalence, ranging from 50 percent to 98 percent (1-7).

In light of these studies, much has been done to try to treat the vision problems contributing to the delinquency. In several studies, delinquents were given help for their vision problems, in the form of spectacle correction and/or vision training. Results of these studies

demonstrated significant behavioral improvements after the remediation. Roger Dowis mentions three studies which indicate that treating vision problems can make a large improvement in recidivism rates. In 1972, a vision training program was instituted at the Plainfield State Boys School. The juveniles who participated for 10 weeks gained nearly two grade levels in reading, and only 6.5 percent were arrested again, compared to an overall 31 percent recidivism rate for the school (3). In 1978, Bachara and Zaba reported that after a juvenile treatment program in Tidewater, Virginia, involving special education, tutoring, or visual-perceptual-motor training, there was a 6.5 percent recidivism rate as compared to 41.6 percent in the untreated group (10). Dowis reported that recidivism in a group at Lookout Mountain School who received vision therapy went from 18 percent to four percent, which was significant at the .005 level (3). Dr. Kaseno reported that after vision training, IQ increased from 90 to 95, the average reading grade level went from 5 to 8.5, and recidivism decreased from a projected average of 60 percent to 14 percent (5).

Most studies have been focused on juvenile delinquents. There have been very few studies assessing the visual status of adult offenders, who are often grown up juvenile offenders. This means that as many adult offenders should be expected to have vision problems as do juveniles. Malcolm feels that the child who has discrepancies between learning potential and academic performance often becomes the socially dysfunctional adult (11). Because of the tremendous social and economic burdens resulting from criminal behavior, all options for reducing its impact should be explored.

A basic purpose of the study was to determine the rate of visual anomalies among adult criminals. The areas we were most interested in evaluating included: ocular health, accommodative/vergence skills, eye movement skills and visual perceptual abilities.

METHODS

Subjects were 53 adult sexual offenders incarcerated at the

Oregon State Correctional Facility in Salem, Oregon. The subjects were all males, ranging in age from 23 to 63. Subjects resided in two different wards. They were assigned based on intellectual abilities, and abilities to function normally in the day to day world. Of the lower functioning (SS) ward, 23 inmates, or 77 percent participated in our study, and of the higher functioning (HF) 30 inmates, or 97 percent participated. The members of the SS unit had IQ's between 65 and 85 and /or were unable to read and write. They were receiving treatment for their sexual offenses as well as training in basic life skills. The HF group members all had IQ's greater than 85 and were being treated for their sexual offenses only.

A history was taken from each subject concerning personal and family ocular health. None of the subjects reported any experience with vision training in the past.

Each subject underwent a one-hour battery of tests. Ocular health was examined using a transilluminator to assess external health and pupil responses, and a Welch Allyn direct ophthalmoscope to assess internal eye health. Visual Acuities (VA's) were measured at far with B-VAT II SG. Near VA's were assessed with a standard chart at 40 cm with standard illumination.

Accommodative/vergence function was assessed with cover tests, stereoacuity, near point of convergence (NPC), lens rock, prism rock, and Monocular Estimation Method (MEM).

Binocular status was assessed both far and near with cover tests and stereo acuity. Cover tests were performed using an alphabet pencil (National Pen) at near, and an outdoor distance target located greater than 50 meters away. Stereoacuity was assessed at far with the B-VAT II SG (four circle binocular stereoacuity assessment program), and at near with the stereofly (Stereo optical), using the Wirt circles.

Accommodative and vergence facility were assessed using NPC, lens rock, prism rock, and MEM. The NPC was measured using a yellow five mm bead with a 20/80 letter "t" on it. The prism rock test was done with six prism diopters BI and BO flippers. The subject was asked to clear and read 20/30 letters. The letters were arranged in columns of three. Three letters in each column were read

aloud before flipping the lenses and going on to the next column. A suppression control consisting of polaroid glasses and a bar reader was used. The subject was timed for one minute, and the number of cycles recorded. One cycle included focusing and clearing BI and BO sides of a flipper. The same protocol was used for the lens rocks, using a +/- 2.0 D lens flipper. The accommodative posture was estimated with MEM dynamic retinoscopy. MEM was performed using a Welch Allyn retinoscope. The target used had 20/100 letters at a 50 cm distance, which is equivalent to a 20/80 demand at 40 cm. In this technique, each eye is scoped separately, and the amount of movement of the reflex is estimated. A trial lens is then inserted briefly in front of the eye as it is scoped. This is repeated with different lenses until a neutral reflex is seen. The dioptric amount of trial lens power needed to neutralize the reflex is then recorded as the MEM result.

Two visual perceptual tests were used. These were the Test Of Visual Perceptual Skills(TVPS) and the Beery Visual Motor Integration(VMI) test. The TVPS includes tests of visual discrimination, visual memory, visual spatial relations, visual form constancy, visual sequential memory, visual figure ground and visual closure. Each of these sections is scored and the sum of scaled scores, percentile rank, perceptual quotient and median perceptual age are recorded. The highest perceptual age possible is 12 years 11 months. Each of several sections on the test is preceded by instructions which are read aloud by the examiner to the subject. The subject then gets one practice run to be sure the instructions were understood. The Beery VMI is a test of motor development which involves copying several drawings from the test booklet to another sheet of paper. Subjects are not allowed to trace the drawing and are not allowed to erase their drawing (14). The highest age equivalent attainable on this test is 13 years.

Three eye movement tests were used, including the Developmental Eye Movement test (DEM), the Groffman Visual Tracing test, and a subjective evaluation of pursuit and saccade ability. The DEM test consists of three subtests involving columns of numbers. The pre-test includes a line of numbers printed

horizontally. The numbers must be correctly identified prior to administration of the rest of the test. Three timed tests are then administered. Each of the first two tests consists of columns of numbers, which the subject must call off as quickly and accurately as possible. These are tests for automaticity, or the ability to easily call off numbers as they are read. The third test consists of 16 lines of numbers, randomly spaced, which are read horizontally instead of vertically. Any errors are recorded as substitution, omission, transposition or addition errors. The two vertical test times are added together and are recorded as total vertical test time. The test times are then adjusted according to the number of errors, using the formula of (Time x 80)/(80-o+a) where 80 is the total number of characters printed, "a" is additions and "o" is omissions. A ratio is then determined using adjusted horizontal and vertical times. Each score is then converted from a raw score to a standard score, percent rank and age score. Since the DEM is not scaled for greater than 13 years, subjects who scored above this, were considered normal, and data were recorded as >/= 13.11 years (12).

The Groffman Visual Tracing Test consists of five separate lines running from a letter on one side of the paper to a number on the other side. The lines are intertwined in the form of a maze, and the subjects must follow each line using their eyes only to reach the other side and determine at which number the line ends up. The test is then scored on the basis of points, which are calculated using number of mistakes and time taken to complete (15).

Pursuit and saccadic eye movements were measured using one white bead and one red bead. These eye movements were measured subjectively by the same examiner throughout testing. The examiner made observations based on the amount of head movement required and the accuracy of the eye movements. The accuracy of the eye movements was recorded on a number scale with "3" being excellent, requiring no head movements at all and hitting or following the target exactly, "2" being average, using no head movements but some over- or undershooting or loss of target, and "1" being poor, using head movements and/or inability to follow the target.

Each test in the battery was administered by third year

optometry students from Pacific University College of Optometry. A clinical advisor was in attendance at all times. All testing was done on the wards at the Oregon State Correctional Facility in Salem, Oregon.

RESULTS

Test results were statistically analyzed using ANOVA on Statview 512+ software, except for cover test and eye movements, which were analyzed using the Mann-Whitney U Test on Statview 512+. All raw data are included in Appendix A.

Ocular health status, history, and visual acuities were unremarkable for all subjects.

TABLE 1

HF Ward cover test	far	near	SS Ward cover test	far	near
esophore	11	7	esophore	3	3
exophore	10	12	exophore	8	9
orthophore	7	8	orthophore	9	8
exotrope	1	2	exotrope	3	3
esotrope	1	1	esotrope	0	0

Table one shows results of cover tests for each group. The Mann-Whitney U test on Statview 512+ showed no significant difference between the two groups.

TABLE 2

	Mean			Mean	
HF Ward	Far	Near	SS Ward	Far	Near
Stereoacuity	89.5"	68"	Stereoacuity	91.3"	63.7"

TABLE 3

	Mean			Mean	
HF Ward	Break	Recovery	SS Ward	Break	Recovery
NPC (cm)	5.9	6.5	NPC	8.7	8.6

TABLE 4

	Mean cycles				Mean Cycles		
HF Ward	OD	OS	OU	SS Ward	OD	OS	OU
Lens Rock	5.4	4.8	6.8	Lens Rock	4.4	4.7	7.4

TABLE 5

	Mean Cycles		Mean Cycles
HF Ward		SS Ward	
Prism Rock	3.0	Prism Rock	6.7

Tables 2 through 5 show the results of the stereoacuity, the NPC, lens rock and prism rock tests. Statistical analysis of these tests shows that there was no significant difference between the groups in any of these tests.

TABLE 6

	Mean			Mean	
HF Ward	OD	OS	SS Ward	OD	OS
MEM (D)	+1.61	+1.65	MEM(D)	+.41	+.41

Table 6 shows the results of MEM testing. The difference between the two groups is significant for each eye at the $p<.05$ level.

TABLE 7

	Mean		Mean
HF Ward	Perceptual Age	SS ward	Perceptual Age
TVPS	12 yrs. 6 mo.	TVPS	10 yrs. 7 mo..

TABLE 8

	Mean		Mean
HF Ward	Age Equivalent	SS Ward	Age Equivalent
Beery VMI	10 yrs. 11 mo.	Beery VMI	8 yrs. 7 mo.

Tables 7 and 8 show the results of the visual perceptual tests. The differences between the two groups were significant at the $p<.05$ level for each test.

TABLE 9

		Means			
		Vertical	Horizontal	Ratio	Error
HF Ward	DEM	12 yr.. 7 mo.	12 yr. 9 mo.	12 yr. 5 mo.	13 yr. 1 mo.
SS Ward	DEM	11 yr. 0 mo.	11 yr. 2 mo.	10 yr. 4 mo.	11 yr.. 7 mo

TABLE 10

HF Ward	Mean Age Equivalent	SS Ward	Mean Age Equivalent
Groffman	12 + years	Groffman	8 Years

Tables 9 and 10 show the results of eye movement testing. The differences between the two groups were significant at $p<.05$ level. Subjective evaluation of pursuits and saccades showed no significant difference between the two groups when analyzed with the Mann-Whitney U Test.

DISCUSSION

As mentioned before, we expected higher performance from the HF group in the tests of visual perceptual ability. This was borne out on the eye movement tests such as the DEM and the Groffman, and perceptual tests such as the Beery and the TVPS. Contrary to our expectation, we found that the SS group performed better on some of the basic accommodative/vergence visual skills tests, such as the MEM and the tests for vergence facility.

Tests grouped in the eye movement category included the DEM and the Groffman. In these testing areas, the SS group performed at a significantly lower level than did the HF group. These group differences were not noted with subjective bead skill eye movement evaluation. Because most of the SS subjects do not or cannot read, the difference in accurate eye movement abilities was an expected difference.

Specific tests used to evaluate visual perceptual function were the TVPS and the Beery VMI. Again, as expected, the SS subjects scored significantly lower than the HF group. As previously stated, perceptual skills are involved in social function, so this was not a

particularly surprising result.

The accommodative/vergence tests overall did not show a significant difference between the two groups. There were, however, two tests on which the SS subjects performed better than the HF group. These tests were the MEM and the vergence facility test. Our initial impression was that the difference in accommodative posture was a function of age difference between the two groups. The mean age, however, for the two groups did not differ significantly. For the HF group the mean age was 32 with a range of 23 to 63, and for the SS subjects it was 32.3 with a range of 23 to 62. Therefore it was unlikely that age was the cause of the difference. It is noteworthy that in perusing the data for the HF group, four individuals with lags greater than 2D were in their 20's, two in their 40's, and one in his 30's. In the SS group, four of the individuals actually exhibited a lead rather than a lag. Since there was no significant difference in the VA's between the two groups, we can assume that this did not play a role in the difference on MEM. The other accommodative/vergence test on which the SS group outperformed the HF group was the prism rock test. We can assume that this difference was not due to difficulties with manipulating a lens flipper, because there was no difference noted in lens rock, where an accommodative flipper was used instead of a prism flipper with the same protocol. Although there was a difference in vergence facility between the two groups, there was no difference in NPC. The difference may be due to the fact that in the HF group, there were 12 subjects who were not able to perform even one full cycle. Future research should explore whether divergence or convergence was the limiting factor in ability to do prism rock.

The difference in monocular acuities between the two groups might be accounted for by methodological differences among the examiners.

Why do these two groups differ in these specific areas? One reason might be that we are dealing with separate populations who differ not only in intellectual potential, but also in other functions and skills.

CONCLUSION

Neither group performed at the expected adult level on any of the tests. On all visual perceptual tests, the HF group outperformed the SS group significantly. Unexpectedly, the two groups differed in certain basic visual skill areas, specifically the prism rock and MEM tests.

As expected, neither group showed any abnormalities in the ocular health categories.

Although the groups did not differ in binocular acuities, significant differences were found in monocular acuities at distance only.

Due to the large lags seen in some subjects with the MEM testing, it is recommended that there should be further evaluation and remediation for possible nearpoint accommodative dysfunction.

Based on the scores of the SS group on the visual perceptual tests, it would be interesting to determine if visual perceptual training would benefit these individuals, and in turn, result in a decreased rate of recidivism.

Because of the small sample size and the special nature of this population, the results obtained here should be replicated before being generalized to the entire prison population. Since reading levels were not available for all of the subjects in this study, these should be determined and taken into account in future studies. This study should be followed up by a vision therapy program. Will the rate of recidivism change between the groups receiving VT and those not receiving it, and will that rate be comparable to that seen with juvenile delinquents? Because these subjects were participants in a volunteer therapy program, we cannot generalize our results to a prison population. Although this is the case, an improvement in recidivism in any size group would be both beneficial and cost effective to society.

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Appendix A

	C	D
61	External	Internal
62	Pupils	
63	1	1
64	1	1
65	1	1
66	1	1
67	1	1
68	1	1
69	1	1
70	1	1
71	1	1
72	1	1
73	1	3
74	1	1
75	1	1
76	1	1
77	1	1
78	1	1
79	1	1
80	1	1
81	1	1
82	1	1
83	1	1
84	1	1
85	1	1

	F	G
61	MEM	
62	OD	OS
63	0.50	0.50
64	0.50	0.50
65	-0.25	-0.25
66	0.00	0.00
67	0.75	0.75
68	0.50	0.50
69	-0.25	-0.25
70	1.00	1.00
71	-0.50	-0.50
72	-0.75	-0.75
73	-1.00	-1.00
74	0.25	0.25
75	0.75	0.75
76	0.75	0.75
77	1.00	1.00
78	0.75	0.75
79	0.25	0.25
80	1.25	1.25
81	0.50	0.50
82	1.00	1.00
83	1.25	1.25
84	0.75	0.75
85	0.50	0.50

	I	J
61	Cover Test	
62	Far	Near
63	2	2
64	1	1
65	0	0
66	2	2
67	2	2
68	4	4
69	2	0
70	4	2
71	0	2
72	1	2
73	2	0
74	0	0
75	2	4
76	0	2
77	2	2
78	7	7
79	0	0
80	0	0
81	0	2
82	2	0
83	0	1
84	0	0
85	1	1

DEM Vertical and Horizontal LF

	L	M	N	O	P	Q	R	S	T	U
61	Vertical					Horizontal				
62	Raw	Std	%	Age	Age in months	Raw	Std	%	Age	Age in months
63	25		>99	>13.11	167	45	82.5	12.5	9-9.11	114
64	85.3	84	15	<6	72	51	95	37.5	9.11	119
65	38	98	45	11-11.11	138	47	98	45	10-10.11	126
66	106.7	67	1	<6	72	47	98	45	10-10.11	126
67	26	119	90	>13.11	167	27	>133	>99	>13.11	167
68	25	124	95	>13.11	167	29	119	90	>13.11	167
69	37	100	50	11-11.11	138	41	98	45	12-12.11	150
70	33	108	70	13-13.11	167	39	102	55	12-12.11	150
71	33	108	70	13-13.11	167	38	96	40	13-13.11	162
72	0	0	0	0	0	0	0	0	0	
73	49	94	35	8-8.11	107	54	92	30	9-9.11	114
74	46	100	50	8-8.11	107	55	82.5	12.5	9-9.11	114
75	29	110	75	>13.11	167	34	106	65	>13.11	167
76	33	100	50	>13.11	167	32	110	75	>13.11	167
77	56	97	42.5	7-7.11	95	60	94	35	8-8.11	102
78	49	108	70	7-7.11	95	39	102	55	12-12.11	150
79	25	124	95	>13.11	167	28	133	99	>13.11	167
80	49	94	35	8-8.11	107	62	92	30	8-8.11	102
81	61	98	45	6-6.11	78	107	94	35	<6	72
82	29	110	75	>13.11	167	40	100	50	12-12.11	150
83	29	110	75	>13.11	167	33	108	70	>13.11	167
84	49	94	35	8-8.11	107	65	90	25	8-8.11	102
85	46	100	50	8-8.11	107	56.5	98	45	8-8.11	102

DEM Ratio and Error LF

	V	W	X	Y	Z	AA	AB	AC	AD	AE
61	Ratio					Error				
62	Raw	Std	%	Age	Age in months	Raw	Std	%	Age	
63	1.78	90	25	<6	72	10	99	47.5	7.11	95
64	1.67	91	27.5	7	84	5	90	25	8.11	107
65	1.24	97	42.5	8-8.11	102	1	102	55	>13.11	167
66	2.27	78	7.5	<6	72	12	97	42.5	7-7.11	90
67	1.03	119	90	>13.11	167	0	133	99	>13.11	167
68	1.16	97	42.5	11-11.11	138	2	92	30	10-10.11	102
69	1.108	107	67.5	>13.11	167	0	133	99	>13.11	167
70	1.18	96	40	10-10.11	126	0	133	99	>13.11	167
71	1.15	98	45	11-11.11	138	0	133	99	13-13.11	162
72	-	-	-	-		-	-	-	-	
73	1.102	104	60	>13.11	167	0	133	99	>13.11	167
74	1.19	95	37.5	10-10.11	126	0	104	60	>13.11	167
75	1.17	96	40	11-11.11	138	0	110	75	>13.11	167
76	0.97	121	92.5	>13.11	167	0	108	70	>13.11	167
77	1.07	108	70	>13.11	167	0	104	60	>13.11	167
78	1.25	96	40	8-8.11	102	2	92	30	10-10.11	126
79	1.12	98	45	13-13.11	167	0	133	99	>13.11	167
80	1.26	96	40	8-8.11	102	0	116	85	8-8.11	102
81	1.75	91	25.7	<6	72	7	106	65	<6	72
82	1.38	87	20	8-8.11	102	0	104	60	>13.11	167
83	1.14	94	35	12-12.11	150	0	110	75	>13.11	167
84	1.32	91	27.5	8-8.11	102	0	116	85	8-8.11	102
85	1.22	99	47.5	8-8.11	102	5	90	25	8-8.11	102

	AK	AL
61	Randot	
62	Far	Near
63	60	20
64	180	70
65	120	70
66	0	50
67	60	50
68	0	70
69	60	40
70	30	25
71	15	40
72	180	0
73	15	70
74	120	70
75	180	0
76	0	50
77	0	100
78	180	0
79	120	20
80	0	70
81	120	25
82	60	70
83	120	25
84	240	30
85	240	500

	AN	AO	AP
61	VA Far		
62	OD	OS	OU
63	15	15	15
64	25	30	25
65	20	20	20
66	125	125	100
67	15	25	0
68	20	20	20
69	25	20	15
70	15	15	15
71	20	20	15
72	30	30	30
73	15	15	15
74	20	20	20
75	30	20	20
76	20	25	20
77	60	100	0
78	15	20	15
79	20	25	15
80	15	15	15
81	20	20	20
82	15	15	15
83	25	25	20
84	80	60	0
85	15	15	15

	AN	AO	AP
61	VA Far		
62	OD	OS	OU
63	15	15	15
64	25	30	25
65	20	20	20
66	125	125	100
67	15	25	0
68	20	20	20
69	25	20	15
70	15	15	15
71	20	20	15
72	30	30	30
73	15	15	15
74	20	20	20
75	30	20	20
76	20	25	20
77	60	100	0
78	15	20	15
79	20	25	15
80	15	15	15
81	20	20	20
82	15	15	15
83	25	25	20
84	80	60	0
85	15	15	15

	AY	AZ
61	NPC	
62	brk	rec
63	10	5
64	10	10
65	15	15
66	7.5	7.5
67	10	7.5
68	0	17.5
69	0	0
70	10	7.5
71	2	1
72	20	20
73	5	5
74	15	15
75	15	20
76	7.5	7.5
77	15	12.5
78	15	10
79	7.5	5
80	0	0
81	10	10
82	10	7.5
83	10	7.5
84	5	7
85	0	0

	BA	BB	BC	BD
61	TVPS			
62	PQ	PR	MPA	Σ
63	44	1	56	16
64	79	8	92	50
65	74	4	98	45
66	98	45	120	68
67	94	34	109	64
68	110	75	140	80
69	75	5	103	46
70	110	75	152	80
71	115	84	156	84
72	54	1	49	26
73	118	88	156	87
74	107	68	156	77
75	89	23	133	59
76	93	32	124	63
77	129	97	156	98
78	81	10	97	52
79	59	89	156	88
80	148	99	156	116
81	101	53	156	71
82	126	96	156	95
83	120	91	156	89
84	77	6	97	48
85	109	73	156	79

	BF	BG	BH	BI
61	Berry			
62	RS	AE	VMI%	VMI Std.
63	13	82	68	11
64	10	67	52	10
65	12	77	66	10
66	12	77	66	10
67	16	103	57	10
68	13	82	68	11
69	14	87	55	10
70	19	138	48	10
71	18	127	44	10
72	14	87	55	10
73	0	0	0	0
74	19	138	48	10
75	19	138	48	10
76	10	67	52	10
77	19	138	48	10
78	11	70	65	10
79	21	157	37	9
80	18	127	44	10
81	14	87	55	10
82	20	151	52	10
83	13	82	68	11
84	21	157	37	9
85	17	119	57	10

	BK
61	Groffman
62	Points
63	0
64	0
65	10
66	16
67	33
68	21
69	0
70	19
71	0
72	0
73	11
74	14
75	7
76	23
77	40
78	24
79	29
80	32
81	13
82	19
83	25
84	23
85	

	CT	CU	CV	CW
62	Δ RK	ARK		
63		CD	CS	CU
64	2	-	-	-
65	0.5	8	7	9
66	5	11	9	12
67	1.5	3	3.5	3
68	1.5	3.5	4	8
69	1.5	8.5	9.5	8.5
70	6.5	5.5	3.5	4
71	1.5	0	0	4
72	16	15.5	16.5	14.5
73	5.5	5	6	6.5
74	0.5	12.5	11.5	11.5
75	0.5	2.5	0	0
76	0.5	12	9	10
77	5	14	14.5	10.5
78	0.5	0	0	0
79	0.5	9	7.5	9
80	0.5	7	7.5	7.5
81	6	0.5	0.5	0.5
82	0.5	0	0	0
83	0.5	3	3.5	5
84	0.5	0	0	10.5
85	2.5	4.5	3	7
86	0.5	5.5	5	8.5
87	4	0.5	0.5	9
88	4	0.5	0.5	5
89	2.5	7.5	9.5	9
90	8	8	0.5	8.5
91	0.5	8.5	0.5	9
92	6	0.5	0.5	0.5
93	5.5	0.5	5.5	6

	BQ	BR
62	External	Internal
63	Pupils	
64	1	1
65	1	1
66	2	2
67	1	1
68	1	1
69	1	1
70	1	1
71	1	1
72	1	1
73	1	1
74	1	1
75	2	2
76	1	2
77	1	1
78	3	3
79	3	3
80	1	1
81	1	1
82	1	1
83	1	1
84	1	1
85	1	1
86	1	1
87	1	1
88	1	1
89	1	1
90	1	1
91	1	1
92	1	1
93	1	1

	BT	BU
62	MEM	
63	OD	OS
64	2.25	2.25
65	1.75	1.75
66	1.75	1.75
67	2.50	2.50
68	2.50	2.50
69	1.75	1.75
70	1.25	1.25
71	1.25	1.25
72	2.50	2.50
73	1.67	1.67
74	0.75	1.12
75	1.25	1.25
76	1.12	1.12
77	2.67	2.67
78	1.37	1.37
79	1.75	1.87
80	1.50	1.50
81	2.50	2.50
82	1.12	1.12
83	1.50	1.50
84	1.50	2.00
85	1.75	1.75
86	1.75	1.75
87	1.50	1.50
88	1.67	1.67
89	1.75	1.75
90	1.00	1.00
91	1.00	1.00
92	0.62	0.62
93	1.25	1.25

	BW	BX
62	Cover Test	
63	Far	Near
64	1	2
65	1	1
66	1	2
67	1	1
68	1	2
69	2	7
70	2	0
71	2	0
72	1	2
73	1	0
74	0	0
75	7	7
76	2	0
77	2	2
78	2	2
79	0	0
80	0	0
81	0	2
82	1	1
83	6	6
84	2	2
85	2	2
86	0	1
87	1	1
88	2	2
89	1	2
90	0	2
91	1	1
92	0	0
93	2	1

DEM Horizontal and Vertical HF

	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
62	Vertical					Horizontal				
63	Raw	Std	%	Age	Age in months	Raw	Std	%	Age	Age in months
64	41	84	15	10-10.11	120	41	91	27.5	11-11.11	138
65	27	117.5	87.5	>13.11	167	30	116	85	>13.11	167
66	33	100	50	13-13.11	162	35	104	60	>13.11	167
67	30	106	65	>13.11	167	38	96	40	12.5	149
68	33	100	50	13-13.11	162	30	116	85	>13.11	167
69	27	117.5	87.5	>13.11	167	30	116	85	>13.11	167
70	28	116	85	>13.11	167	35	104	60	>13.11	167
71	32	102	55	>13.11	167	33	108	70	>13.11	167
72	23	100	>133	>13.11	167	25	100	>133	>13.11	167
73	40	87	20	10-10.11	120	48	84	15	10-10.11	126
74	27	117.5	87.5	>13.11	167	29	119	90	>13.11	167
75	32	102	55	>13.11	167	37.5	98	45	13.1-13.11	162
76	38	91	27.5	11-11.11	138	41	91	27.5	11-11.11	138
77	27	116	80	>13.11	167	28	124	95	>13.11	167
78	28	116	85	>13.11	167	29	119	90	>13.11	167
79	27	114.5	87.5	>13.11	167	31	113	80	>13.11	167
80	38	90	25	11-11.11	138	45	87	20	10.5	125
81	29	110	75	>13.11	167	27	133	99	>13.11	167
82	32	102	55	>13.11	167	37	98	45	>13.11	167
83	40	87	20	10-10.11	120	51	76	5	9-9.11	114
84	25	124	95	>13.11	167	27	133	99	>13.11	167
85	47	67	1	7.9	93	42	90	25	11-11.11	138
86	34	96	40	12.5	155	75	67	1	7.5	89
87	34	96	40	12;13	156	36	100	50	>13.11	167
88	33	100	50	13-13.11	162	30	116	85	>13.11	167
89	29	110	75	>13.11	167	30	116	85	>13.11	167
90	46	81	10	8-8.11	107	55.5	61	1	8.5	101
91	29	110	75	>13.11	167	30	116	85	>13.11	167
92	40	87	20	10-10.11	120	33	108	70	>13.11	167
93	42	84	15	9	108	44	88.5	22	11	132

DEM Ratio and Error

	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS
62	Ratio					Error				
63	Raw	Std	%	Age	Age in months	Raw	Std	%	Age	
64	1	118	91	>13.11	167	0	118	91	>13.11	167
65	1.08	107	67.5	>13.11	167	0	107	67.5	>13.11	167
66	1.06	116	85	>13.11	167	0	116	85	>13.11	167
67	1.3	81	10	7.5	95	1	102	55	>13.11	167
68	0.9	133	99	>13.11	167	0	133	99	>13.11	167
69	1.11	100	50	12-12.11	150	0	100	50	>13.11	167
70	1.25	82	12	8.0-8.11	102	0	104	60	8.0-8.11	102
71	1.03	118	89	>13.11	167	0	118	89	>13.11	167
72	1.08	107	67.5	>13.11	167	0	107	67.5	>13.11	167
73	102	84	15	9-9.11	114	0	104	60	9-9.11	114
74	0	113	80	>13.11	167	1.07	113	80	>13.11	167
75	1.17	94	30	10.5	125	1	90	25	>13.11	167
76	1.08	107	67.5	>13.11	167	0	107	67.5	>13.11	167
77	1.04	117.5	97.5	>13.11	167	0	117.5	97.5	>13.11	167
78	1.04	117.5	87.5	>13.11	167	4	84	15	8-8.11	102
79	1.15	92	30	12-12.11	150	0	92	30	>13.11	167
80	1.18	87	20	10-10.11	126	0	87	20	10-10.11	126
81	0.93	123	94	>13.11	167	0	123	94	>13.11	167
82	1.16	91	27.5	11-11.11	138	0	104	60	>13.11	167
83	1.3	79	12	7.9	93	1	94	35	>13.11	167
84	1.08	107	67.5	>13.11	167	0	107	67.5	>13.11	167
85	0.89	133	99	>13.11	167	0	133	99	>13.11	167
86	2.2	81	10	7.5	89	0	104	60	>13.11	167
87	1.06	116	85	>13.11	167	1	102	55	>13.11	167
88	0.9	133	99	>13.11	167	0	133	99	>13.11	167
89	1.03	118	89	>13.11	167	1	102	55	>13.11	167
90	1.21	84	10	9-9.11	114	5	76	5	8-8.11	102
91	1.03	118	89	>13.11	167	0	118	89	>13.11	167
92	0.825			>13.11	167	0			>13.11	167
93	1.04			>13	167	2				

	CY	CZ
62	Randot	
63	Far	Near
64	120	50
65	30	50
66	60	25
67	30	50
68	180	70
69	60	20
70	0	40
71	180	40
72	30	70
73	60	50
74	30	20
75	15	70
76	15	40
77	240	25
78	15	30
79	15	40
80	15	70
81	240	70
82	120	70
83	240	400
84	120	70
85	240	70
86	240	40
87	60	30
88	60	70
89	60	70
90	60	50
91	60	200
92	60	70
93	30	70

	DB	DC	DD	DE	DF	DG	DH
62	VA Far				VA Near		
63	OD	OS	OU		OD	OU	OU
64	25	15	15		20	20	20
65	15	15	15	2	20	20	20
66	15	15	15		20	30	20
67	20	15	15		30	20	20
68	25	25	20		60	60	40
69	15	15	15		20	20	20
70	30	25	20		20	30	30
71	15	25	20		20	40	20
72	20	20	20		20	20	20
73	20	20	20		25	20	20
74	20	20	20		15	15	15
75	15	15	15		20	20	20
76	15	20	15		30	20	20
77	15	20	15		20	30	20
78	15	20	20		20	20	20
79	20	20	20		30	30	30
80	20	20	20		20	20	20
81	20	20	15		30	30	20
82	15	20	15		20	20	20
83	20	20	15		30	30	30
84	25	25	30		40	60	30
85	15	25	20		20	20	20
86	15	20	15		20	20	20
87	15	15	15		20	20	20
88	20	15	15		30	20	20
89	15	15	15		40	30	30
90	15	30	15		20	60	20
91	15	15	15		30	20	20
92	30	30	20		15	15	15
93	20	15	15		30	30	20

	DM	DN
62	NPC	
63	brk	rec
64	2	3
65	0	0
66	2	2.5
67	6	7
68	5	5
69	6	9
70	5	1
71	2	2.5
72	5	5
73	10	10
74	3	8
75	24	24
76	2	6
77	2	4
78	4	4
79	3	5
80	6	8
81	10	10
82	1	2
83	13	15
84	2	3
85	2	3
86	4	4
87	16	8
88	2	4
89	3	4.5
90	1	1
91	5	5
92	1	1.25
93	30	30

	DO	DP	DQ	DR
62	TVPS			
63	PQ	PR	MPA	Σ
64	115	84	156	84
65	135	99	156	104
66	101	53	156	71
67	136	99	156	105
68	111	77	156	81
69	133	99	156	102
70	122	93	156	91
71	130	98	156	99
72	142	99	156	110
73	140	99	156	109
74	127	96	156	96
75	118	88	156	87
76	138	99	156	107
77	103	58	156	73
78	75	5	108	46
79	138	99	156	107
80	106	66	156	76
81	101	53	156	71
82	122	93	156	91
83	123	94	156	92
84	88	21	97	58
85	92	30	122	30
86	108	70	152	78
87	142	99	156	110
88	132	98	156	101
89	124	95	156	93
90	132	98	156	101
91	118	88	156	87
92	113	81	145	83
93	96	39	143	66

	DT	DU	DV	DW
62	Beery			
63	RS	AE	VMI%	VMI Std.
64	23	169	84	12
65	23	169	84	12
66	19	133	48	10
67	23	169	84	12
68	18	127	44	10
69	23	169	84	12
70	14	87	55	10
71	19	138	48	10
72	23	169	84	12
73	9	64	46	9
74	12	77	66	10
75	17	119	57	10
76	21	157	37	9
77	13	82	68	11
78	18	127	44	10
79	24	54	0	13
80	22	163	57	10
81	13	82	68	11
82	24	174	84	13
83	23	169	84	12
84	18	127	44	10
85	14	87	55	10
86	21	157	37	9
87	19	138	48	10
88	23	169	84	12
89	18	126	44	10
90	10	67	65	10
91	20	151	52	10
92	21	157	37	9
93	19	138	48	10

	DY
62	Groffman
63	Points
64	35
65	46
66	38
67	37
68	32
69	42
70	38
71	45
72	50
73	35
74	11
75	44
76	32
77	47
78	16
79	32
80	26
81	25
82	47
83	47
84	35
85	28
86	29
87	49
88	43
89	29
90	19
91	38
92	40
93	25