

A NEUROPSYCHOLOGICAL STUDY
OF
GRAPHICAL COPYING DISABILITY

KATHLEEN MARGARET GRIFFITHS

VOLUME 2
APPENDICES

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VOLUME 2

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APPENDIX A

AN APPENDIX TO CHAPTER 3

APPENDIX A: SUBJECT CHARACTERISTICS

TABLE A-1

Characteristics of Lesion group

Subj.	Sex	Age	Educ.	Motor	Neurological defects ¹			Time since operation ²	Description of Lesion ³
					Somato-sensory	Visual Field	Aphasia		
A	F	31	8	+	+	+	-	4 weeks	SAH and ICH associated with (L) middle cerebral artery aneurysm
B	M	39	12	-	-	-	-	2 weeks	(R) EDH and associated <u>oedema</u> (temporal region) (trauma)
C	F	28	11	+	-	-	-	4 weeks	(R) fronto-parietal ICH and SAH associated with (R) pericallosal artery aneurysm and AVM
D	F	47	10	+	-	-	-	5 weeks	SAH associated with (L) middle cerebral aneurysm
E	M	58	8	+	+	+	-	42 weeks	(R) frontal SAH
F	F	26	12	-	-	-	-	Pre-op.	(L) parietal parasitic granuloma
G	M	51	8	+	-	+	-	27 weeks	(R) posterior temporal and parietal astrocytoma, Grade 3
H	F	41	12	-	-	-	-	Pre-op.	(R) frontal oligodendroglioma
I	F	28	10	+	+	-	-	119 weeks	SAH associated with (R) posterior communicating artery aneurysm (R) parietal branches of MCA occluded by vasospasm-severe infarction of right hemisphere and extensive atrophy.

TABLE A-1 Cont'd

Subj.	Sex	Age	Educ.	Motor	Neurological defects ¹			Time since operation ²	Description of Lesion ³
					Somato-sensory	Visual Field	Aphasia		
J	F	53	8	-	-	-	-	3 weeks	(R) frontal (olfactory groove) meningioma (locally malignant)
K	M	31	10	-	-	-	-	50 weeks	(R) frontal oligo-astrocytoma (anterior and temporal areas also infiltrated)
L	M	62	8	+	-	-	-	1 week	(R) frontal ICH and SDH (trauma)
M	M	52	8	+	+	+	+	1 week	(L) parietal metastatic adenocarcinoma
N	M	29	10	-	-	-	-	Pre-op.	(L) hydrocephalus
O	M	62	8	-	-	-	-	Pre-op.	(R) middle cerebral artery stenosis (Treated by anastomosis between occipital and middle cerebral arteries)
P	F	34	9	+	+	+	-	260 weeks	(R) SAH (post-vasospasm ischaemia, atrophy)
Q	F	32	9	-	-	-	-	46 weeks	(L) frontal abscess
R	M	50	8	+	+	+	-	72 weeks	(R) temporal-parietal ICH

TABLE A-1 Cont'd

Subj.	Sex	Age	Educ.	Motor	Neurological defects ¹			Time since operation ²	Description of Lesion ³
					Somato sensory	Visual Field	Aphasia		
S	F	16	8	-	-	-	-	Pre-op.	SAH associated with (L) parietal AVM
T	F	16	10	+	+	-	+	1 week	(L) frontal oligodendroglioma (deep infiltrating)
U	M	26	10	+	+	-	-	1 week	(R) MCA occlusion (complete) (treated by anastomosis of the superficial temporal artery to middle cerebral artery) (trauma)
V	M	43	8	-	-	-	+	62 weeks	SAH associated with (L) anterior communicating artery aneurysm (vasospasm→fronto-temporal and occipito-parietal infarction)
W	F	55	9	-	-	-	-	197 weeks	SAH associated with (L) MCA aneurysm
X	M	61	8	-	-	-	-	1 week	(R) parasagittal falx meningioma
Y	M	25	15	-	+	-	-	1 week	(L) parietal AVM
Z	F	28	15	+	-	-	+	1 week	(L) temporal SDH, EDH, ICH (trauma)
ZZ	M	50	12	-	-	+	-	164 weeks	(R) intra-ventricular meningioma (trans-parietal surgical approach).

Note: Footnotes 1, 2 and 3 appear overleaf.

¹ Information derived from records of routine neurological tests conducted by Medical Officers/Specialists in the course of the patient's treatment.

- + defect noted
- no defect noted

² Time elapsed between operation and first day of testing, recorded to the nearest week.

-
- ³ (L) = Left hemisphere
(R) = Right hemisphere
- ICH = Intracerebral haematoma
SAH = Sub-arachnoid haematoma
SDH = Sub-dural haematoma
EDH = Extra-dural haematoma
- AVM = Arterio-venous malformation
- MCA = Middle cerebral artery.

TABLE A-2

Characteristics of Control Group

Subject	Sex	Age	Education
1	M	28	12
2	M	39	11
3	M	31	10
4	M	30	12
5	F	42	10
6	F	55	8
7	F	28	9
8	F	39	8
9	M	42	8
10	F	62	8
11	M	58	8
12	F	26	15
13	M	49	9
14	F	17	10

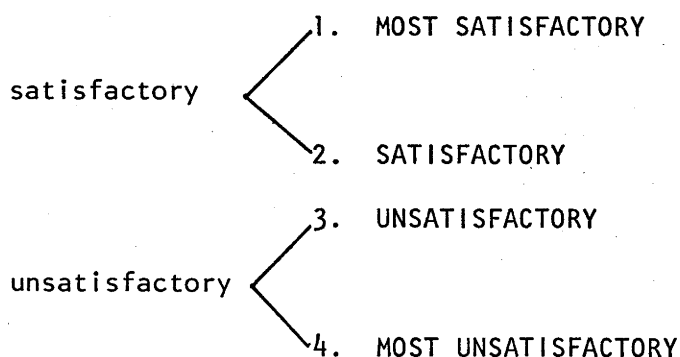
APPENDIX B

/ AN APPENDIX TO CHAPTER 4

APPENDIX B1: WRITTEN INSTRUCTIONS TO JUDGES FOR RATING DRAWINGS
FROM THE GRAPHICAL COPYING TEST.

You will be given a card with a design on it and 45 sheets each containing a copy of the design. The copies were made by normal and brain-damaged subjects who were asked to make a copy as similar as possible to the original. I want you to judge the adequacy of each copy. In doing this, take into account ALL aspects of the copy (e.g. structure, including relationships and proportions of parts, size, orientation, the quality of line and accuracy of execution, any other aspects of the copy).

In judging the adequacy of the copies you should first divide them into two groups: those you judge to be satisfactory reproductions of the original and those you judge to be unsatisfactory reproductions of the original. Each of these groups should then be divided into two groups. Thus the satisfactory copies should be sorted according to whether they are most (as in very) satisfactory or simply satisfactory. Similarly, the unsatisfactory copies should be sorted into the two groups unsatisfactory and most unsatisfactory. Each copy will then have been allocated to one of four categories.



However, it is quite permissible to leave any category empty if you feel that no copy belongs to it.

APPENDIX B2: COPYING DISABILITY INDEX¹ FOR INDIVIDUAL SUBJECTS
IN THE CONTROL AND LESION GROUPS.

<u>Control Group</u>		<u>Lesion Group</u>	
Subject	Index	Subject	Index
1	1.39	A	1.27
2	0.82	B	1.18
3	0.69	C	1.07
4	0.98	D	1.81
5	1.03	E	2.06
6	1.53	F	1.46
7	1.46	G	2.52
8	1.38	H	0.71
9	1.20	I	1.11
10	1.26	J	1.70
11	1.02	K	1.64
12	0.56	L	1.79
13	0.92	M	2.54
14	1.47	N	1.17
		O	1.77
		P	1.64
		Q	1.27
		R	2.20
		S	1.60
		T	2.48
		U	1.16
		V	1.39
		W	1.17
		X	1.69
		Y	1.08
		Z	1.41
		ZZ	1.63

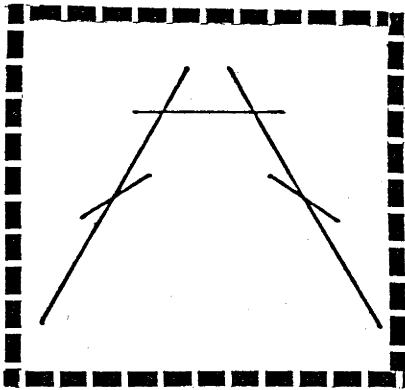
¹ Average rating per judge per design.

APPENDIX C

AN APPENDIX TO CHAPTER 5

APPENDIX C1: DISTRACTOR SETS, COMPLEX PERCEPTUAL DISCRIMINATION
TASK.

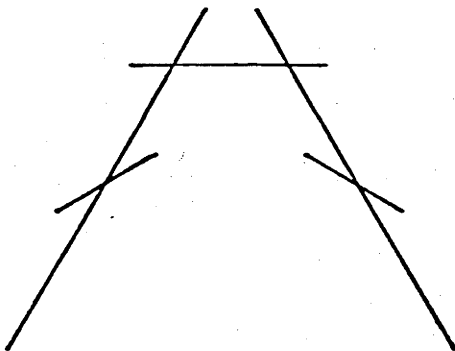
C1-1: Distractors for Embedded symmetrical Standard



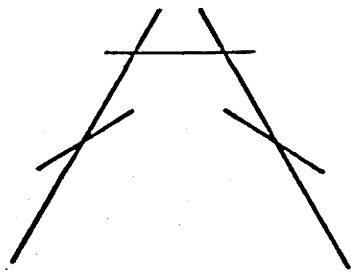
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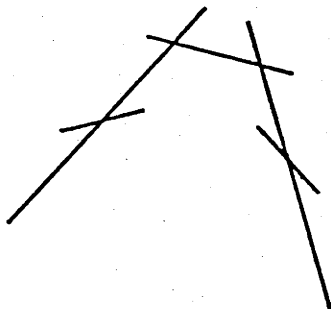
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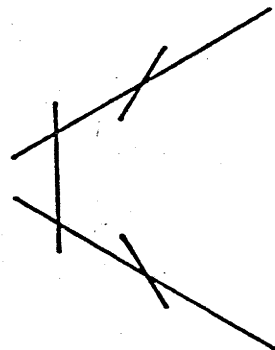
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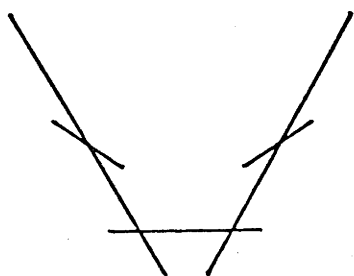
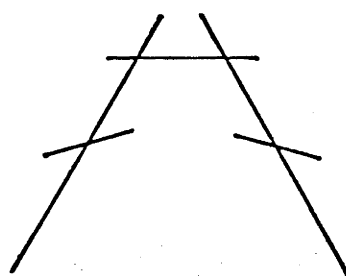
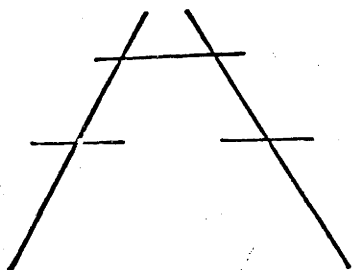
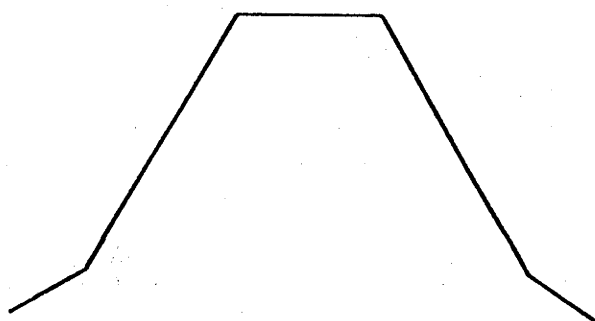
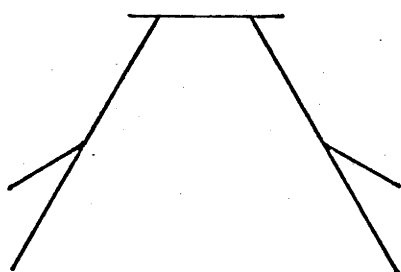
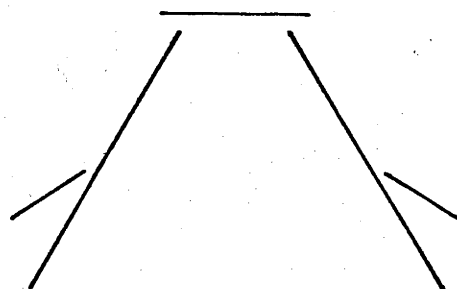
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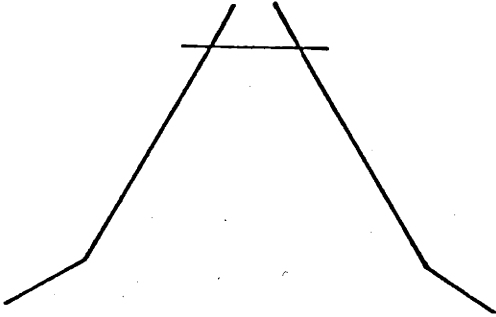
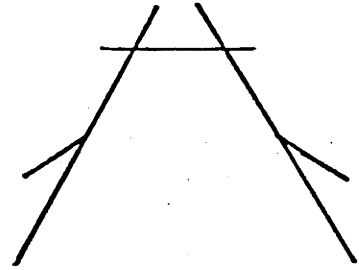
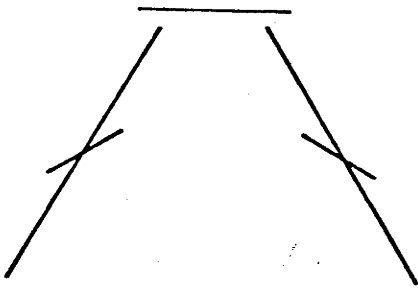
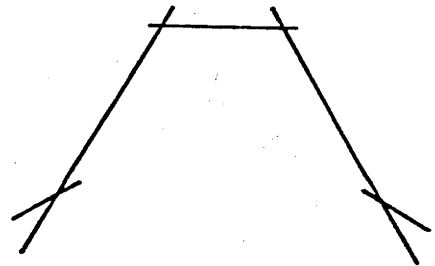
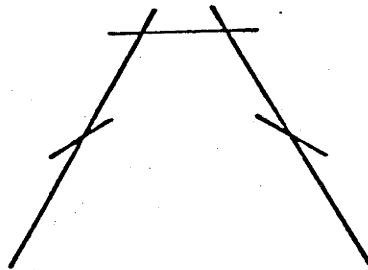


Orientation - 15° global

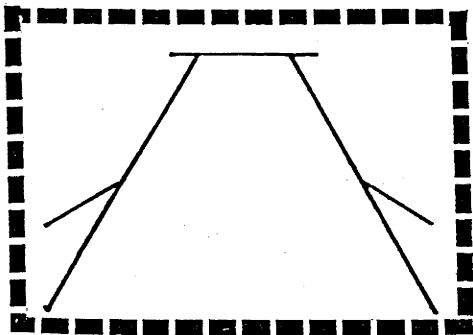


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C1-1: Distractors for Embedded symmetrical Standard (continued)*Orientation - 180° global**Orientation - 15° component**Orientation - h/v component**Structural - global**Structural - global**Structural - global*

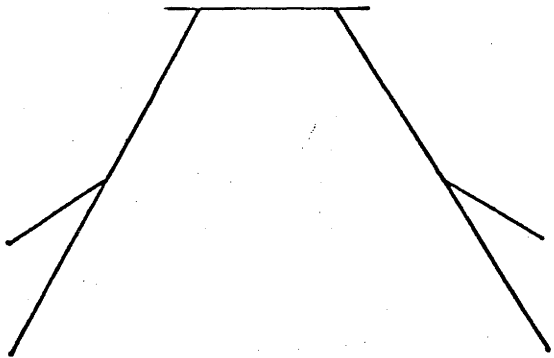
C1-1: Distractors for Embedded symmetrical Standard (continued)*Structural - component**Structural - component**Structural - component**Translational - global**Translational - component*

C1-2: Distractors for Branched symmetrical Standard

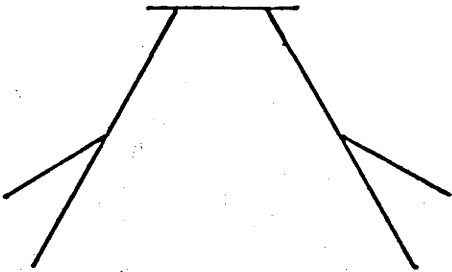


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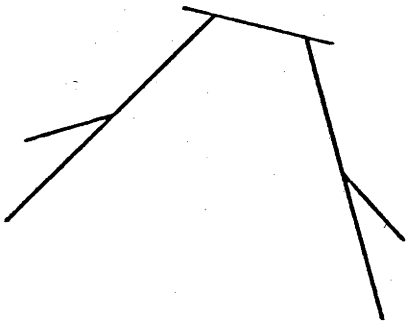
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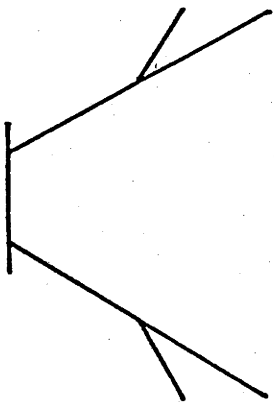
Size - global



Size - component

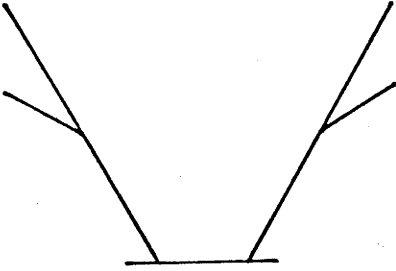


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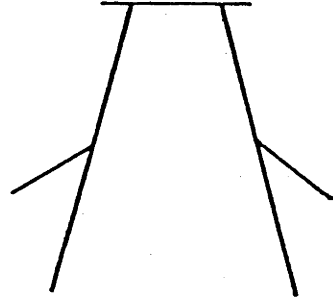


Orientation - 90° global

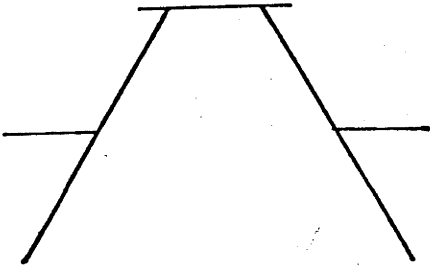
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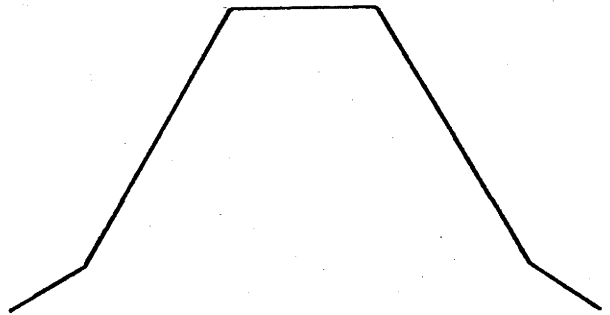
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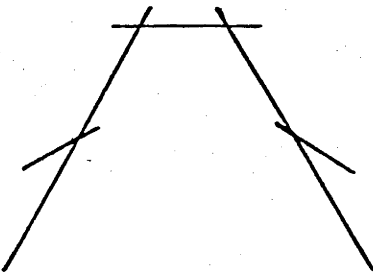
Orientation - 15° component



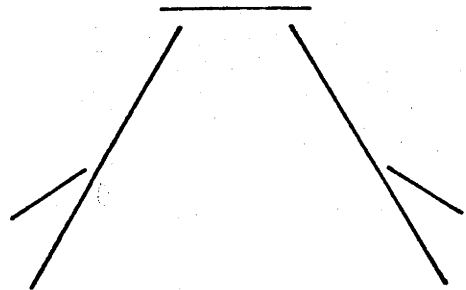
Orientation - h/v component



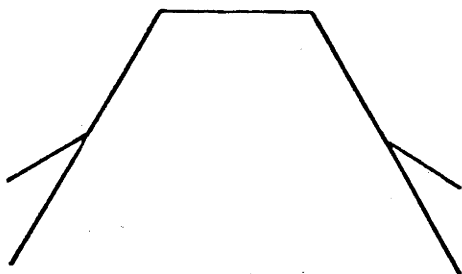
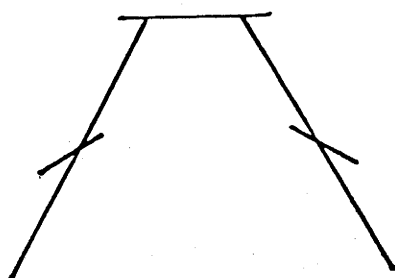
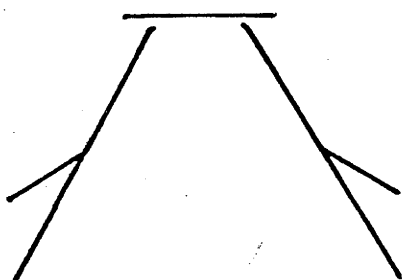
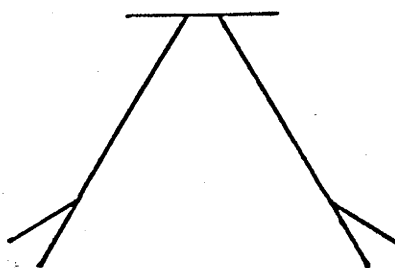
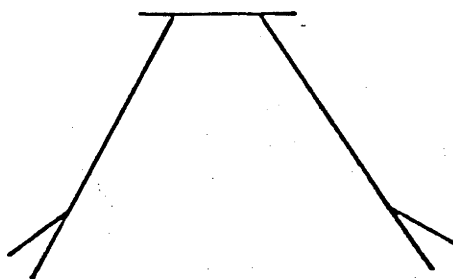
Structural - global



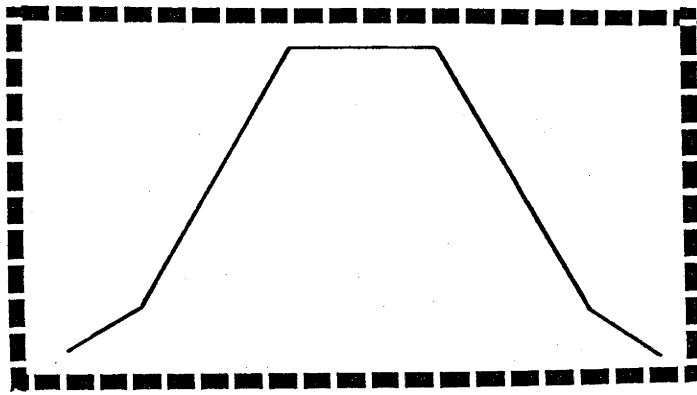
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Structural - global

C1-2: Distractors for Branched symmetrical Standard (continued)*Structural - component**Structural - component**Structural - component**Translational - global**Translational - component*

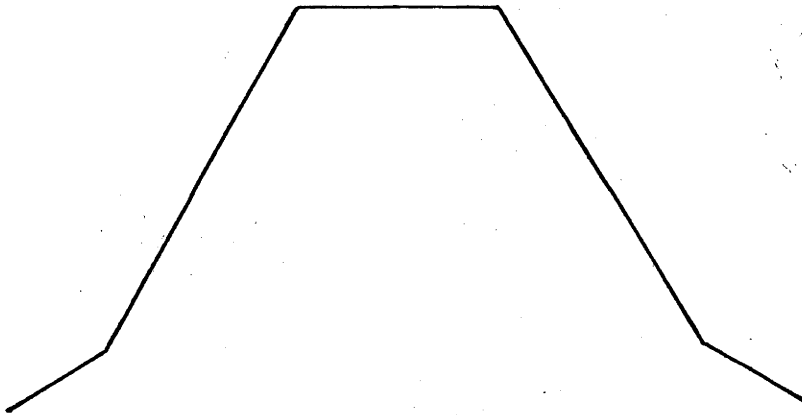
C1-3: Distractors for Chained symmetrical Standard



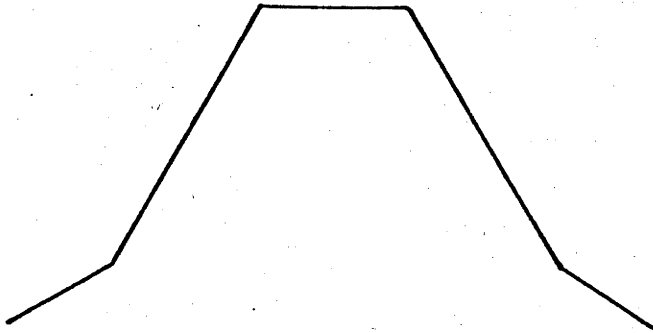
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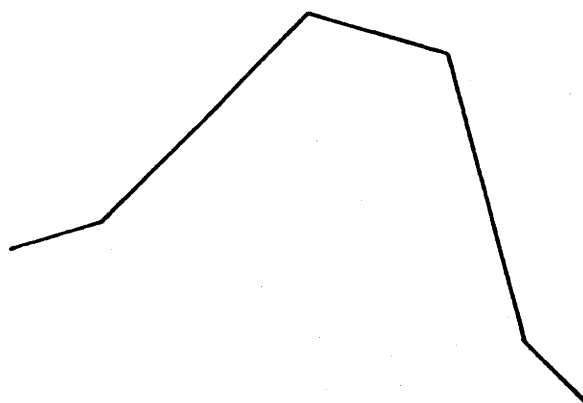
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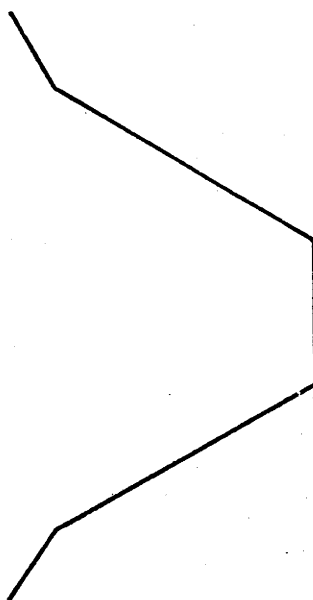
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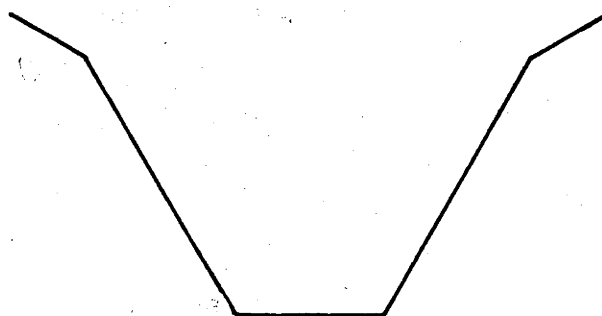
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C1-3: Distractors for Chained symmetrical Standard (continued)

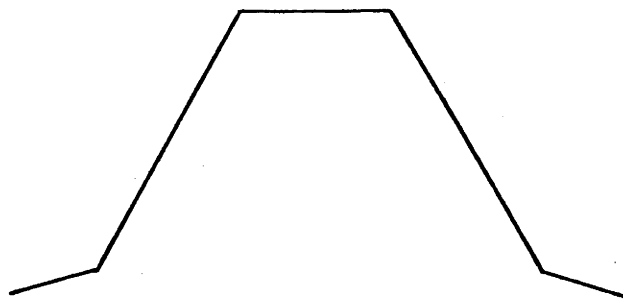
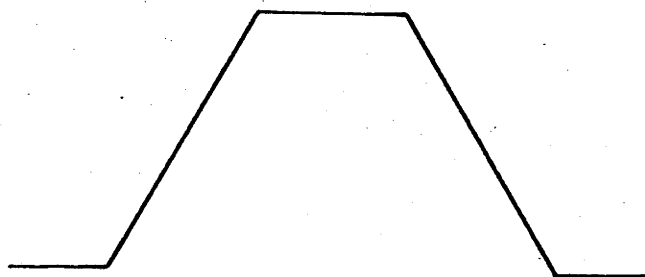
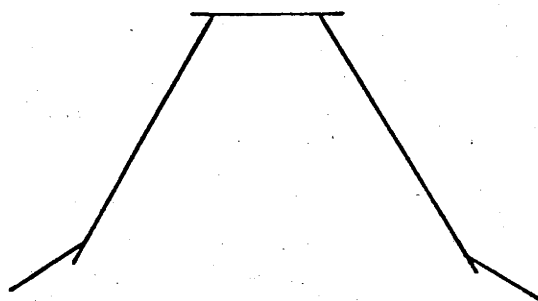
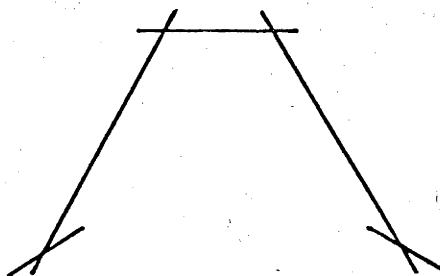
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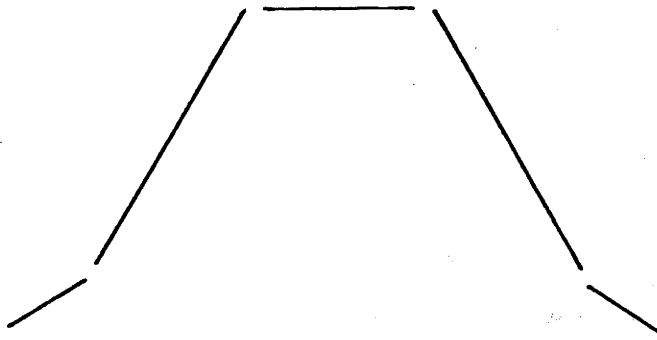
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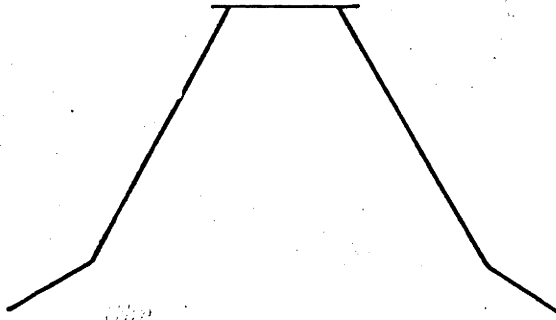
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C1-3: Distractors for Chained symmetrical Standard (continued)*Orientation - 15° component**Orientation - h/v component**Structural - global**Structural - global*

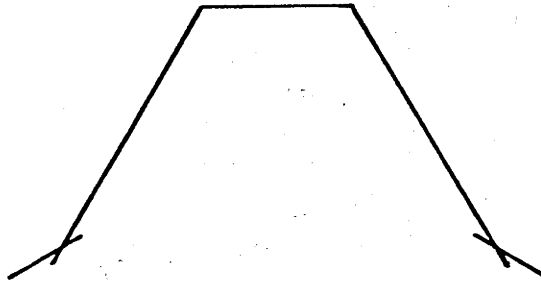
C1-3: Distractors for Chained symmetrical Standard (continued)



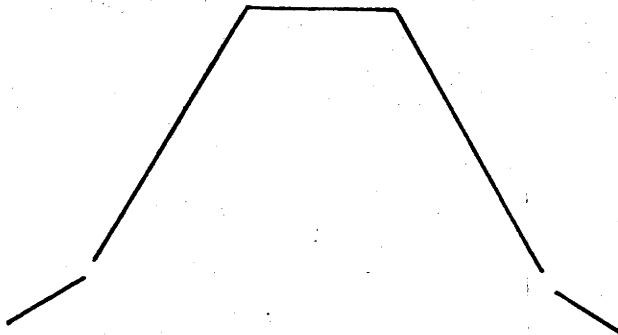
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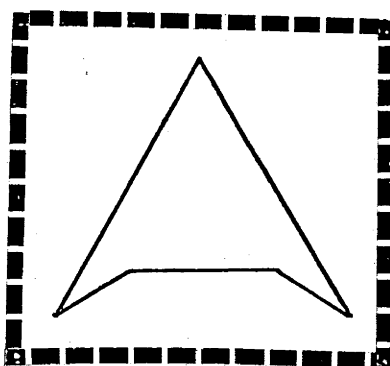
Structural - component



Structural - component



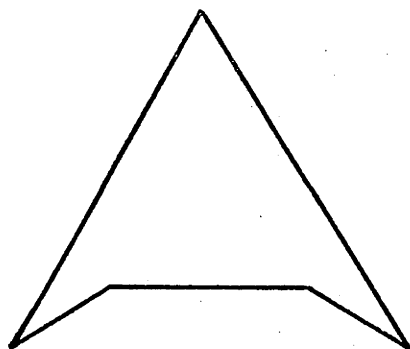
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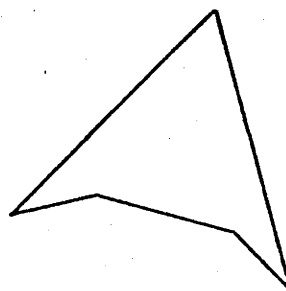
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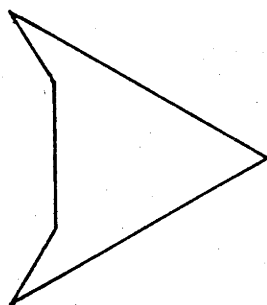
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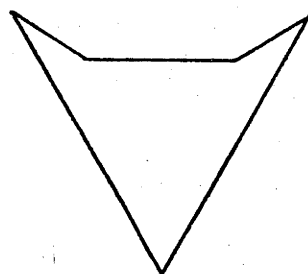
Size - global



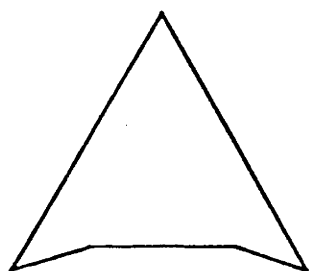
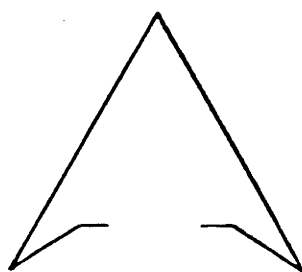
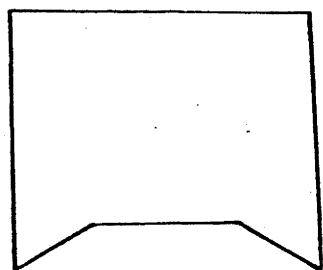
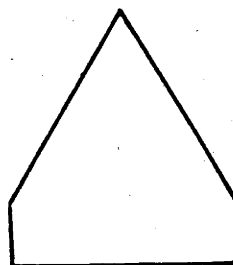
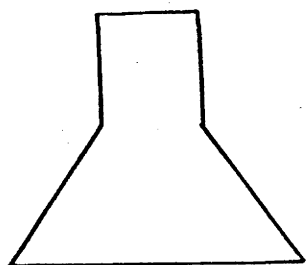
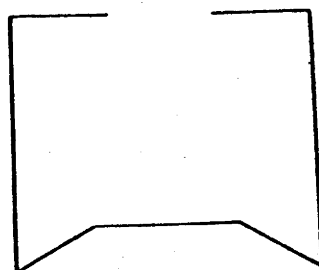
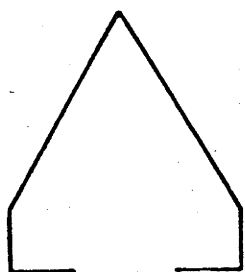
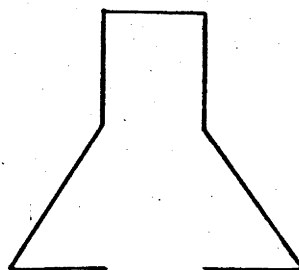
Orientation- 15° global



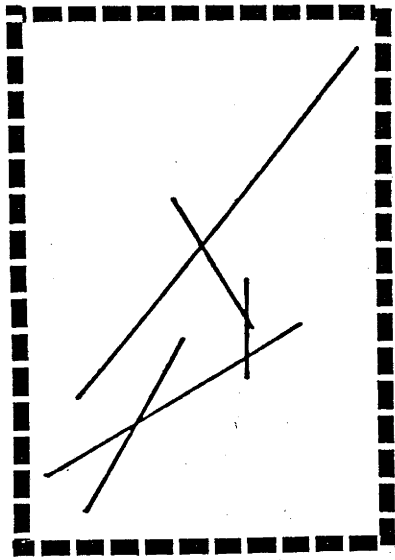
Orientation - 90° global



Orientation - 180° global

C1-4: Distractors for Chained Closed symmetrical Standard (continued)*Orientation - 15° component**Structural - open**Distinguishing-feature
-one (top)**Distinguishing-feature
-one (bottom)**Distinguishing-feature
-two**Distinguishing-feature
-one(top) + open**Distinguishing-feature
one(bottom)
+
open**Distinguishing-feature
two + open*

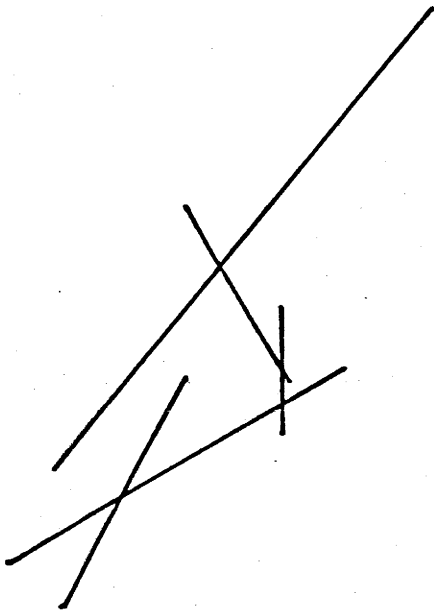
C1-5: Distractors for Embedded asymmetrical Standard



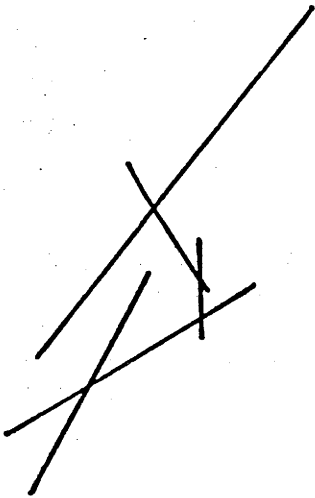
STANDARD



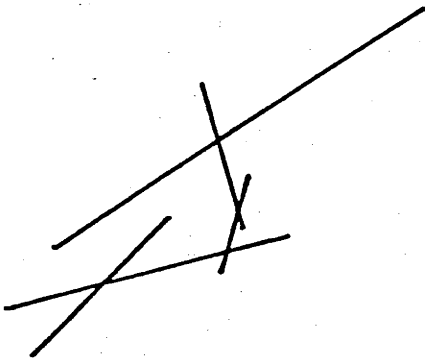
DISTRACTORS



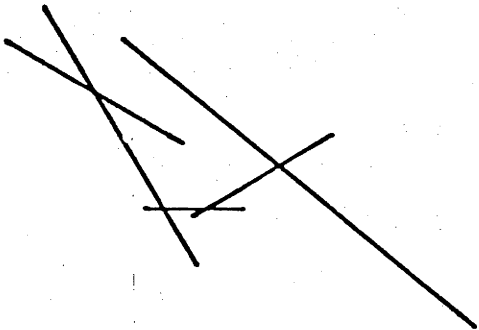
Size - global



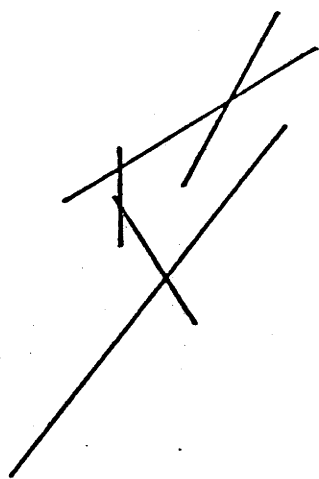
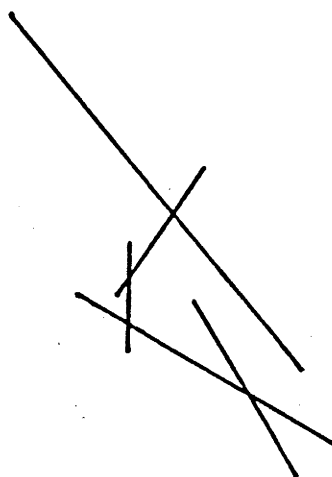
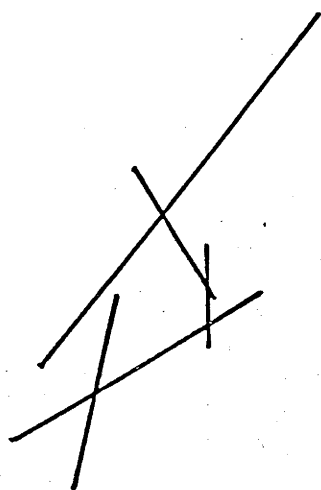
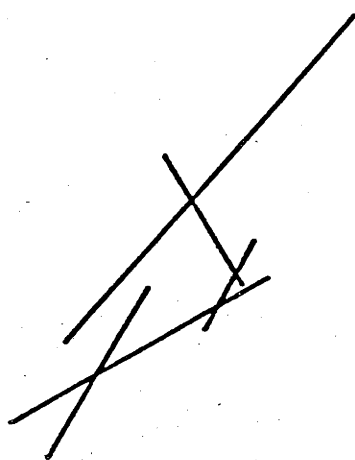
Size - component

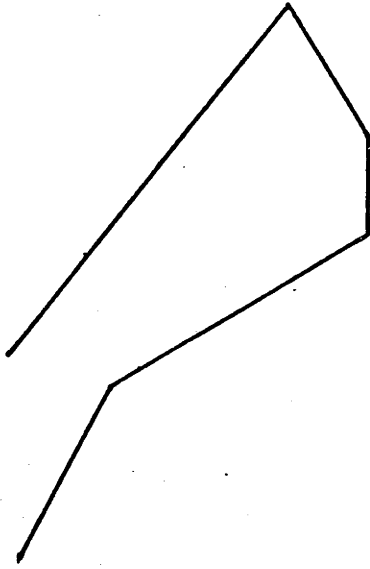
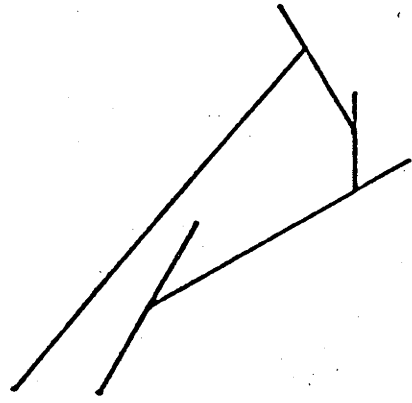
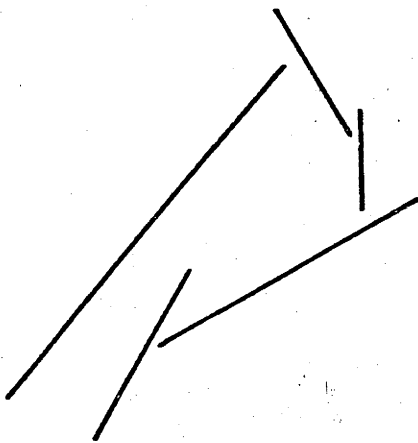
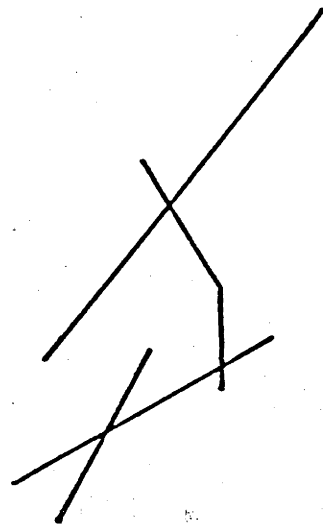


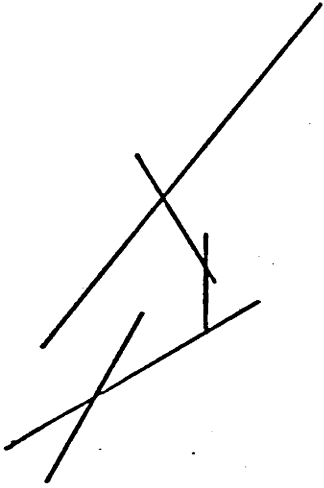
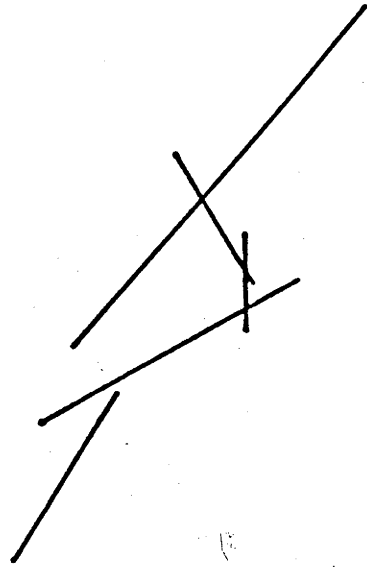
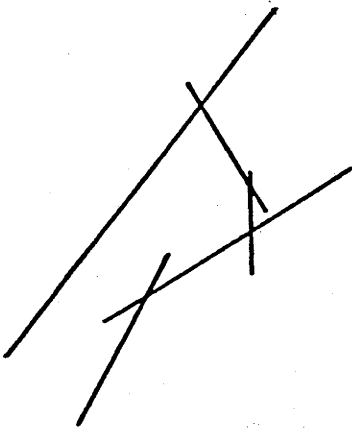
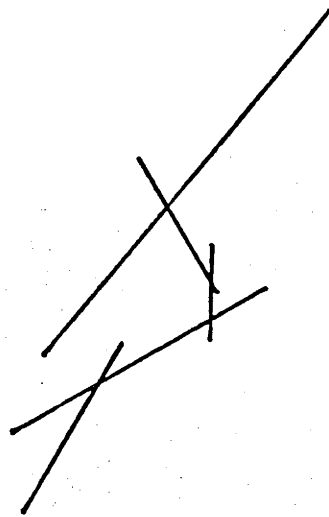
Orientation - 15° global

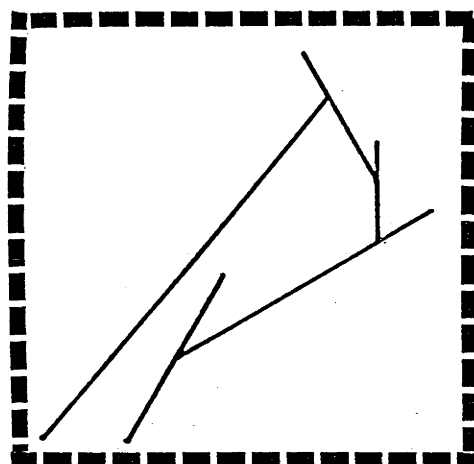


Orientation - 90° global

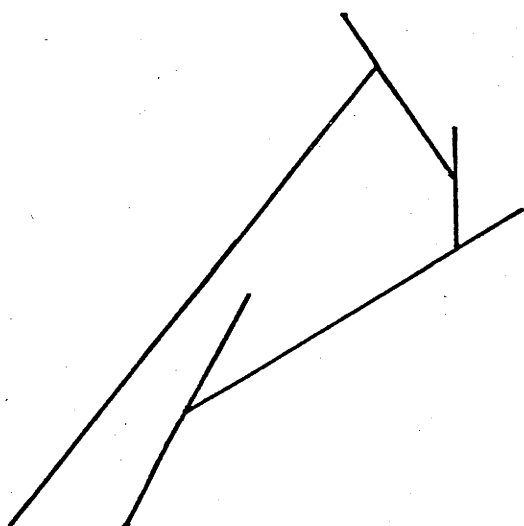
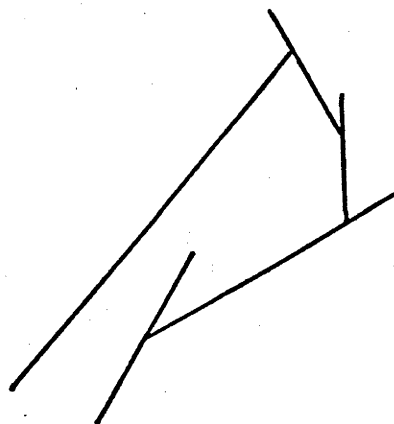
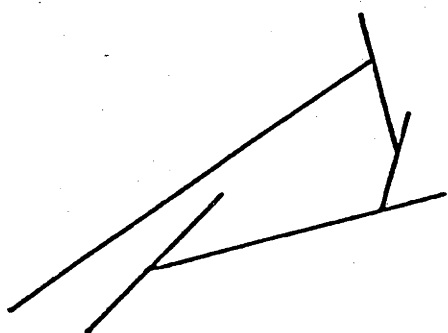
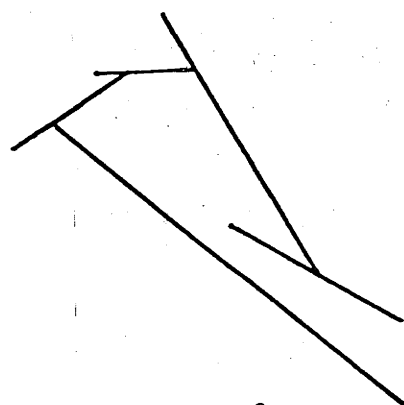
C1-5: Distractors for Embedded asymmetrical Standard (continued)*Orientation - 180° global**Orientation - reflection**Orientation - 15° component**Orientation - h/v component*

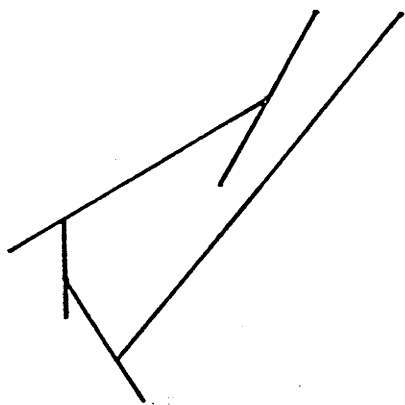
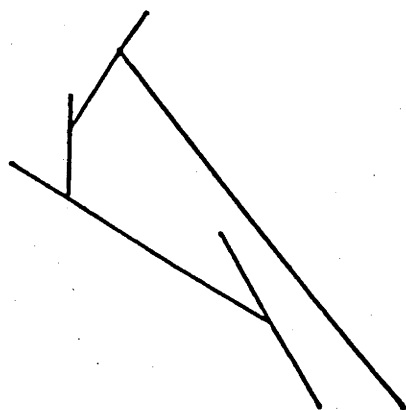
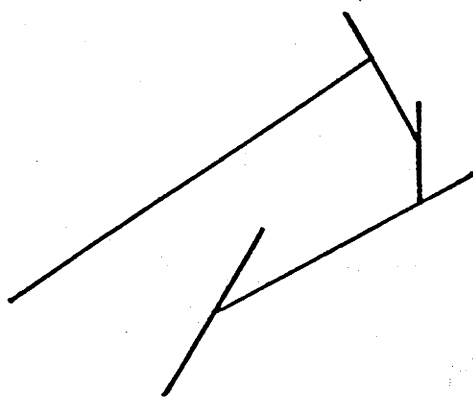
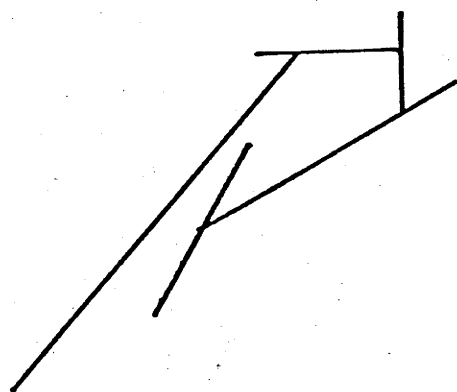
C1-5: Distractors for Embedded asymmetrical Standard (continued)*Structural - global**Structural - global**Structural - global**Structural - component*

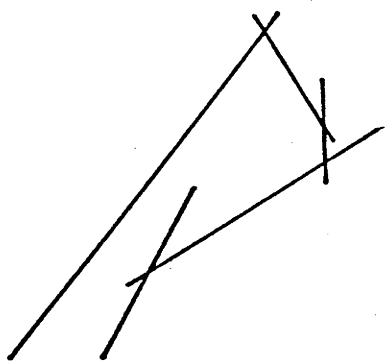
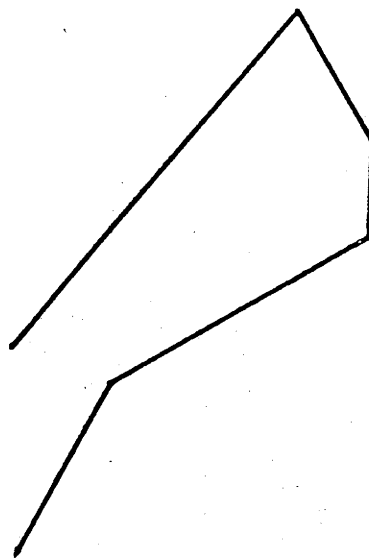
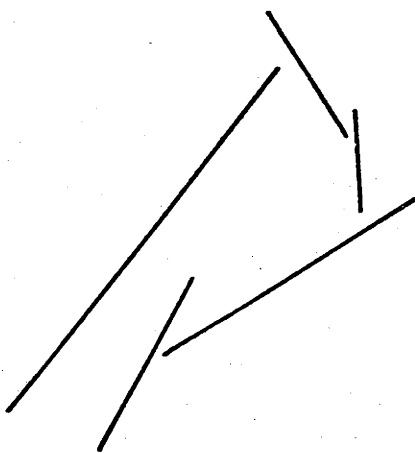
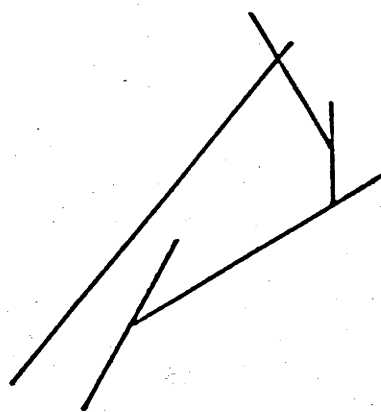
C1-5: Distractors for Embedded asymmetrical Standard (continued)*Structural - component**Structural - component**Translational - global**Translational - component*

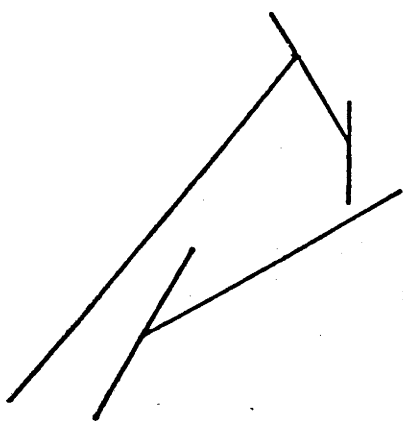
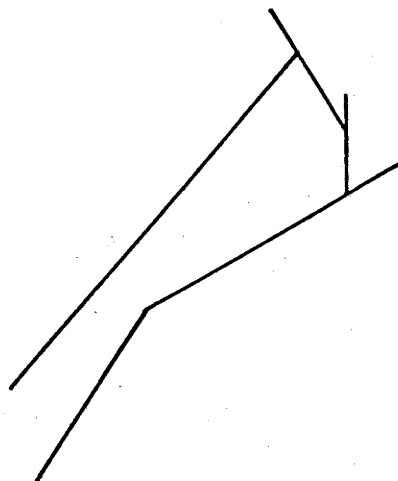
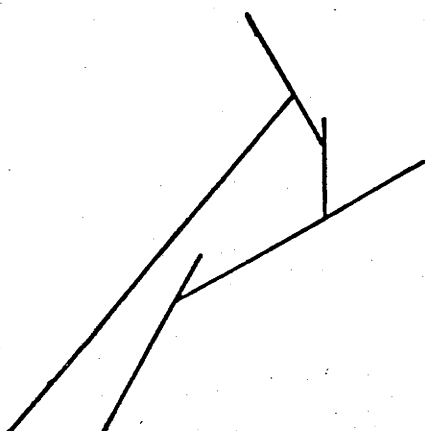
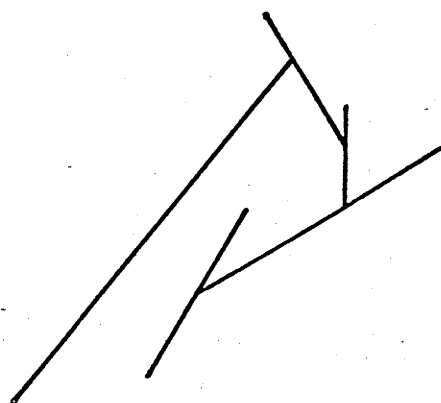
C1-6: Distractors for Branched asymmetrical Standard

STANDARD

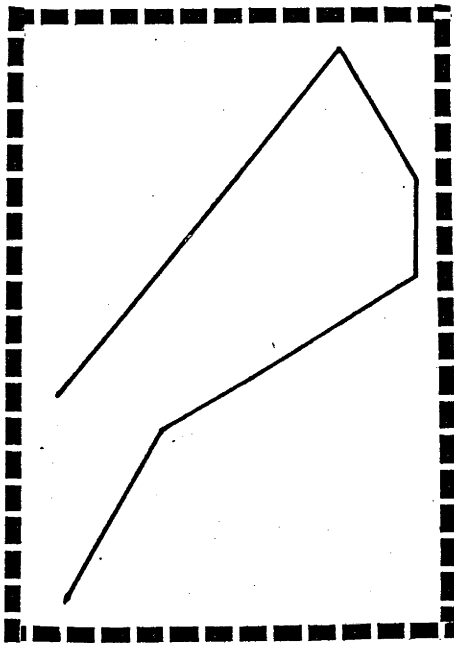
 DISTRACTORS
*Size - global**Size - component**Orientation - 15° global**Orientation - 90° global*

C1-6: Distractors for Branched asymmetrical Standard (continued)*Orientation - 180° global**Orientation - reflection**Orientation - 15° component**Orientation - h/v component*

C1-6: Distractors for Branched asymmetrical Standard (continued)*Structural - global**Structural - global**Structural - global**Structural - component*

C1-6: Distractors for Branched asymmetrical Standard (continued)*Structural - component**Structural - component**Translational - global**Translational - component*

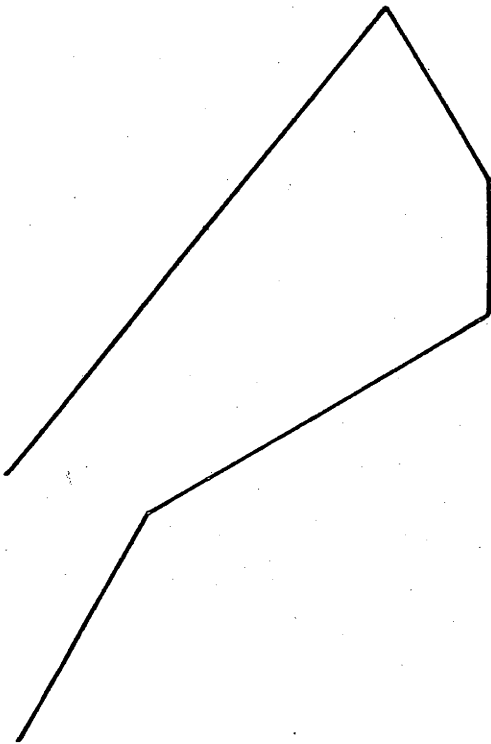
C1-7: Distractors for Chained asymmetrical Standard (continued)



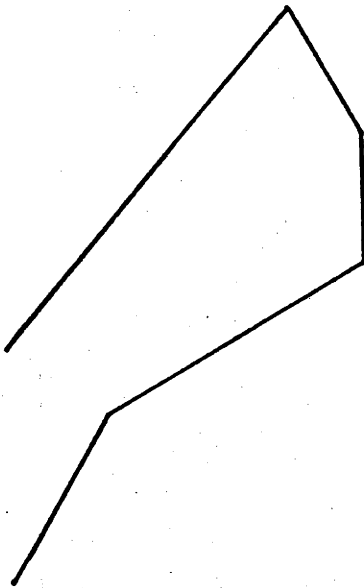
STANDARD



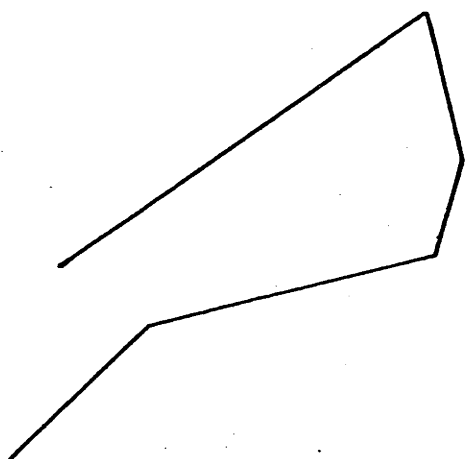
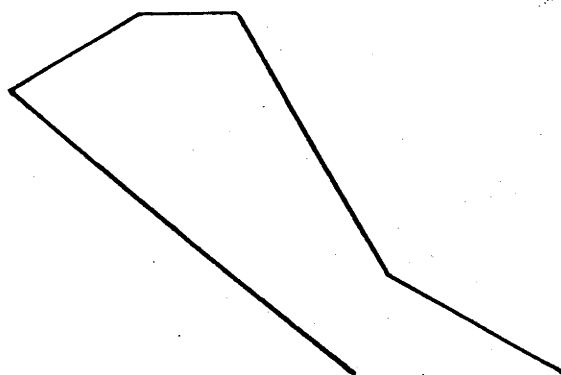
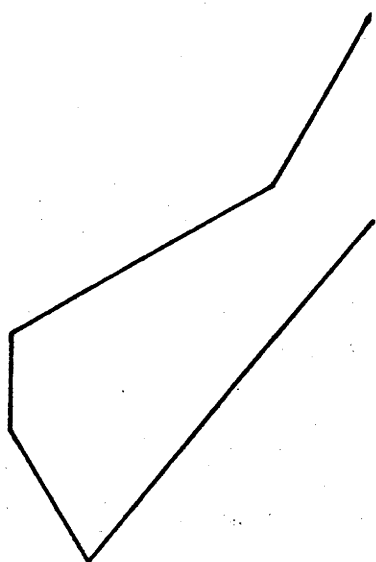
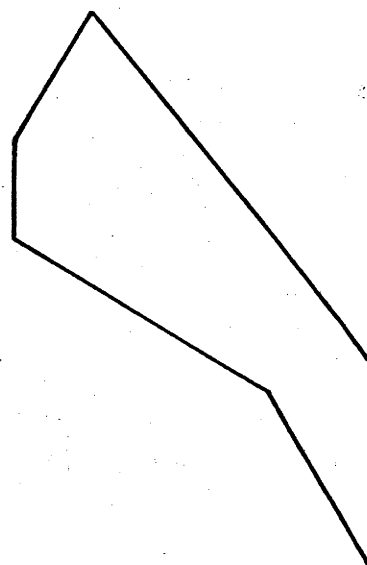
DISTRACTORS



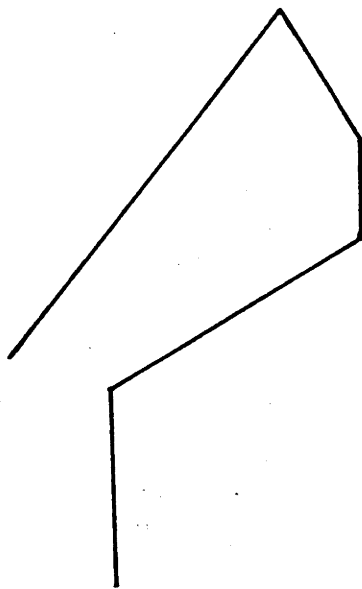
Size - global



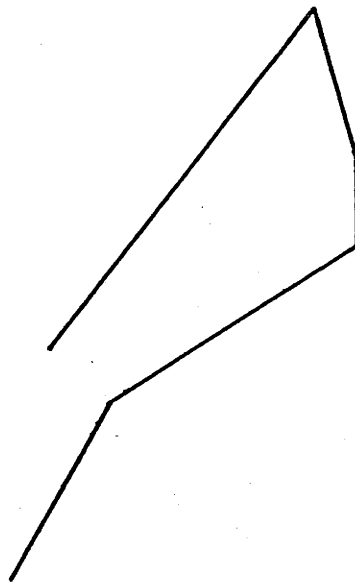
Size - component

C1-7: Distractors for Chained asymmetrical Standard*Orientation - 15° global**Orientation - 90° global**Orientation - 180° global**Orientation - reflection*

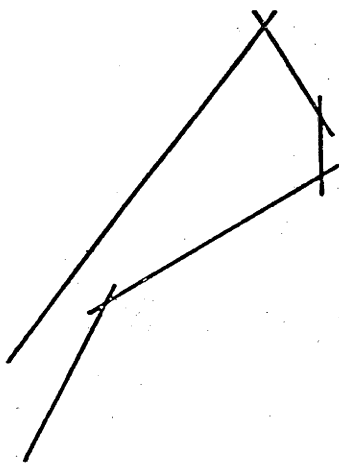
C1-7: Distractors for Chained asymmetrical Standard (continued)



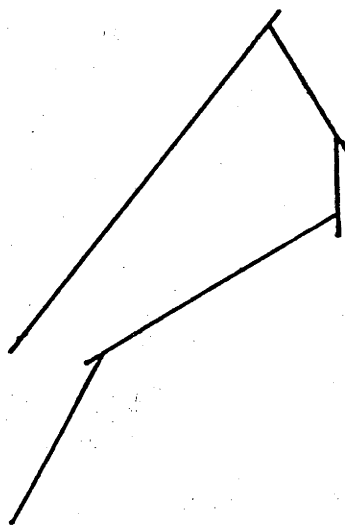
Orientation -h/v component



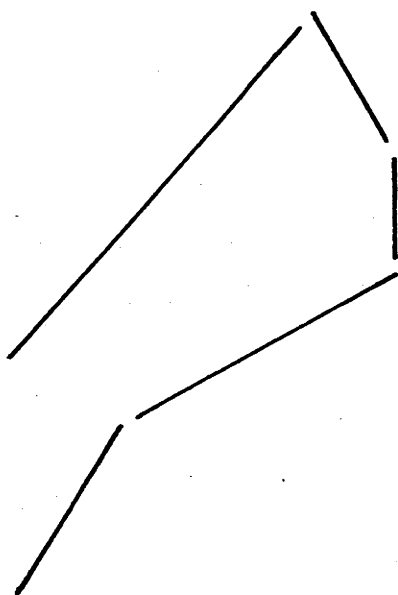
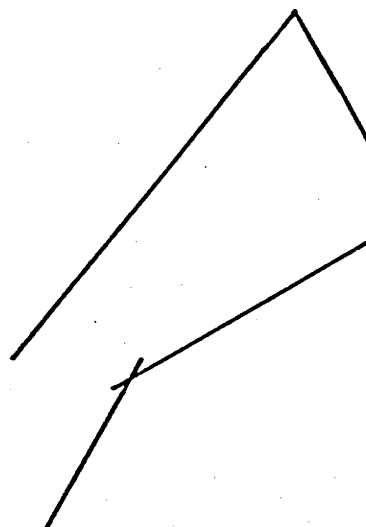
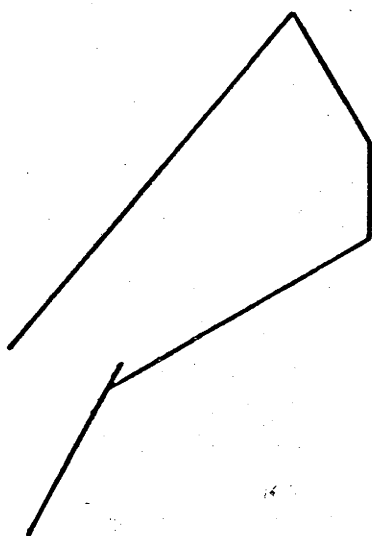
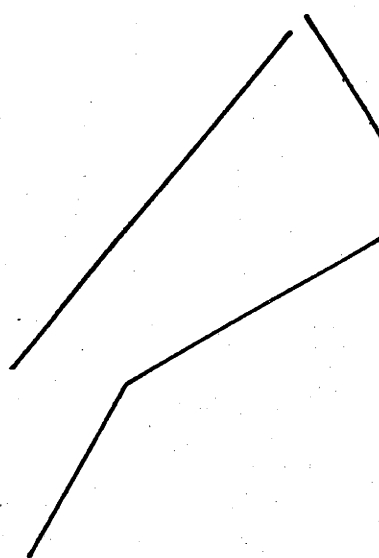
Orientation - 15° component

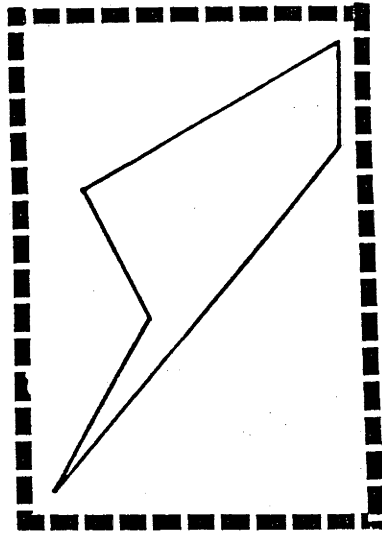


Structural - global



Structural - global

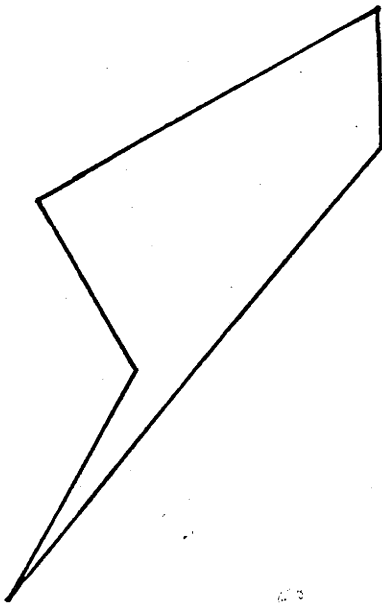
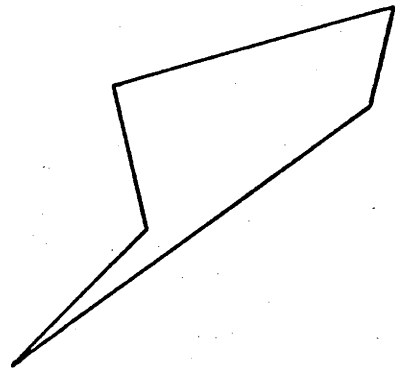
C1-7: Distractors for Chained asymmetrical Standard (continued)*Structural - global**Structural - component**Structural-component**Structural-component*

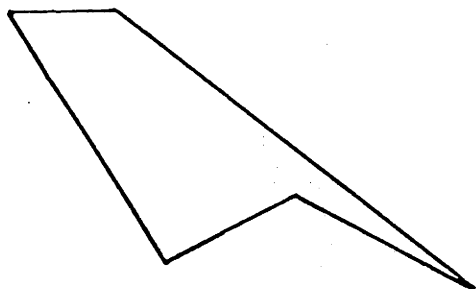
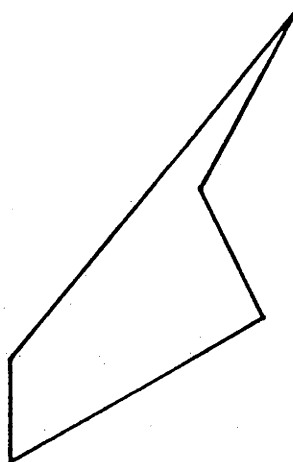
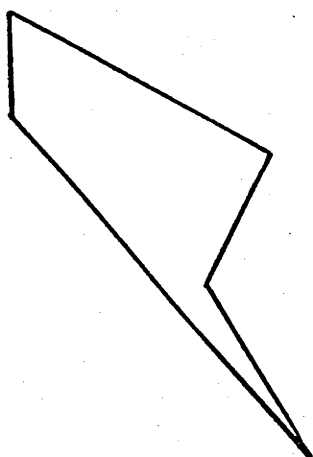
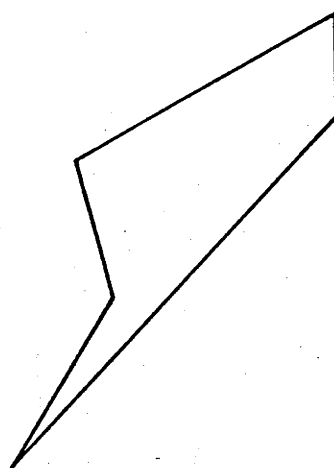
C1-8: Distractors for (Chained) Closed asymmetrical Standard

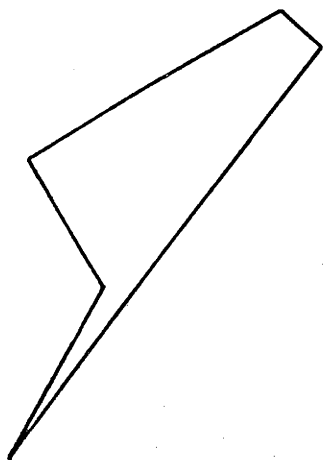
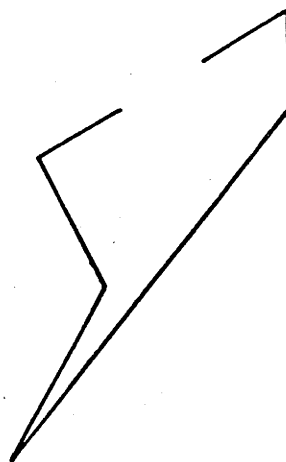
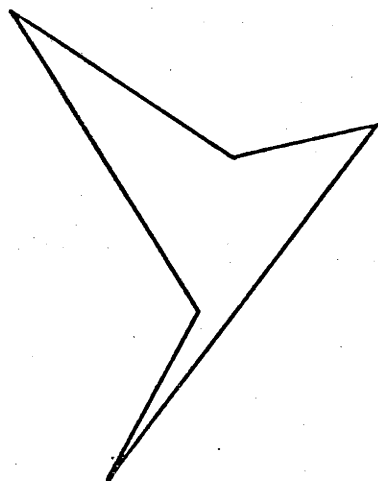
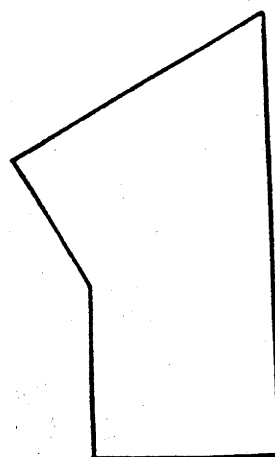
STANDARD

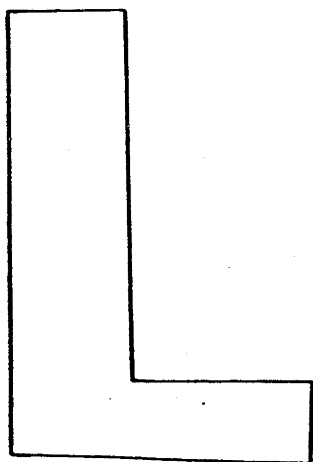


DISTRACTORS

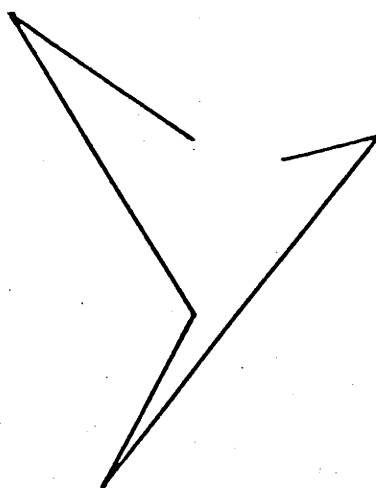
*Size - global**Size - component*

C1-8: Distractors for (Chained) Closed asymmetrical Standard (continued)*Orientation - 90° global**Orientation - 180° global**Orientation - reflection**Orientation - 15° component*

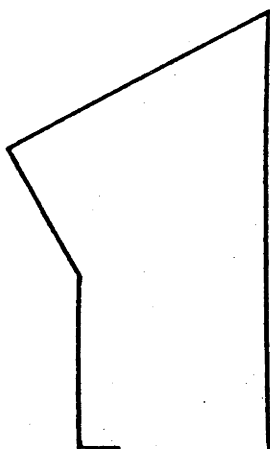
C1-8: Distractors for (Chained) Closed asymmetrical Standard (continued)*Orientation - h/v component**Structural - open**Distinguishing-feature
- one (top)**Distinguishing-feature
- one (bottom)*

C1-8: Distractors for (Chained) Closed asymmetrical Standard(continued)

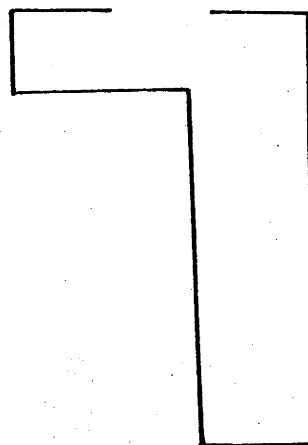
*Distinguishing-feature
-two*



*Distinguishing-feature
one (top) + open*



*Distinguishing-feature
one (bottom) + open*



*Distinguishing-feature
two + open*

APPENDIX C2: ERROR AND RESPONSE LATENCY DATA AND ANALYSES FOR
THE COMPLEX DISCRIMINATION TASK

TABLE C2-1

Total error (across all transformation conditions)
for the Complex Discrimination task

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject Error		Subject Error		Subject Error	
1	6	$\overline{\text{A}}$	4	D	8
2	0	$\overline{\text{B}}$	6	E	22
3	7	$\overline{\text{C}}$	1	G	17
4	7	$\overline{\text{F}}$	7	J	11
5	1	$\overline{\text{H}}$	8	K	8
6	8	$\overline{\text{T}}$	8	L	20
7	3	$\overline{\text{N}}$	7	M	11
8	10	$\overline{\text{Q}}$	2	O	10
9	4	$\overline{\text{U}}$	11	P	7
10	3	$\overline{\text{V}}$	7	R	23
11	6	$\overline{\text{W}}$	4	S	1
12	3	$\overline{\text{Y}}$	1	T	3
13	3	$\overline{\text{Z}}$	5	X	16
14	5			ZZ	7

TABLE C2-2

Analysis of variance of overall error for the Complex
Discrimination task

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between Groups	0.844	2	0.422	5.131	0.011
Within Groups	3.127	38	0.082		

Note: A logarithmic transformation was applied to the errors prior to analysis.

TABLE C2-3

Mean response latency for the Complex Discrimination
task

Control Group		$\overline{\text{GCD}}$ Group		GCD Group	
Subject Latency		Subject Latency		Subject Latency	
1	2.57	$\bar{A}$	1.46	D	2.14
2	1.97	$\bar{B}$	2.13	E	4.75
3	1.16	$\bar{C}$	2.75	G	12.03
4	1.41	$\bar{F}$	7.45	J	4.60
5	2.35	$\bar{H}$	1.82	K	1.71
6	1.96	$\bar{I}$	2.48	L	2.69
7	1.01	$\bar{N}$	0.83	M	2.52
8	1.46	$\bar{Q}$	3.74	O	4.65
9	2.13	$\bar{U}$	5.00	P	5.36
10	5.73	$\bar{V}$	2.59	R	5.00
11	3.05	$\bar{W}$	1.70	S	2.73
12	0.94	$\bar{Y}$	2.21	T	1.86
13	1.90	$\bar{Z}$	2.01	X	3.52
14	1.13			ZZ	4.66

TABLE C2-4

Analysis of variance of mean response latency
for the Complex Discrimination task

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	0.654	2	0.327	6.738	0.0031
Within groups	1.843	38	0.049		

Note: A logarithmic transformation was applied to the response latencies prior to analysis.

TABLE C2-5
Response latency for individual transformation-types for the Complex

Discrimination task																	
TRANSFORMATION TYPE																	
Subject	Global size	Comp. size	Global orient. 15°	Global orient. 90°	Global orient. 180°	Global reflect.	Comp. orient. 15°	Comp. orient. 90°	Global trans.	Comp. trans.	Global struct.	Comp. struct.	Open	1 dist. - feat.	1 dist. - feat. + open	2 dist. - feat.	2 dist. - feat. + open
1	1.73	4.22	2.84	3.25	2.42	2.15	4.39	2.80	2.72	2.47	2.23	3.01	1.24	1.20	1.47	1.35	1.19
2	1.31	4.81	1.43	1.21	1.39	1.51	3.18	2.07	2.26	1.77	1.30	3.02	1.00	1.05	1.02	1.02	1.11
3	1.01	1.46	0.92	1.18	0.83	1.01	1.92	0.99	1.65	1.51	1.01	1.08	0.78	0.84	0.98	0.68	0.86
4	1.10	2.26	1.01	0.90	1.05	1.22	1.91	1.08	1.83	2.97	1.19	1.44	0.91	0.79	1.02	1.01	0.91
5	2.25	7.63	3.63	1.45	1.36	1.47	2.22	1.59	2.68	3.64	1.53	2.57	1.33	1.13	1.07	0.93	0.94
6	2.20	3.07	2.10	1.30	1.56	1.33	2.70	2.04	1.65	2.73	1.47	2.54	1.52	1.08	1.13	1.02	1.35
7	1.02	1.21	1.17	0.78	0.95	0.95	1.18	1.09	1.01	0.99	1.03	1.09	0.69	0.92	0.64	0.87	0.57
8	1.88	1.49	2.25	1.89	1.53	1.31	1.24	1.73	2.10	1.66	1.17	1.43	0.79	0.69	0.69	0.84	0.63
9	1.47	7.60	3.09	1.32	1.23	1.68	2.56	2.11	1.55	2.54	1.79	1.80	1.29	1.03	1.21	1.17	0.96
10	5.81	10.43	5.54	2.05	2.91	2.47	5.52	4.01	6.95	26.54	2.74	5.82	2.00	3.25	2.09	1.70	1.74
11	3.39	4.46	2.58	2.44	1.98	2.43	5.10	2.49	3.40	9.58	1.58	3.26	1.12	1.13	1.51	1.33	0.89
12	0.83	1.19	1.12	0.71	0.73	0.72	0.75	1.15	0.82	1.61	0.85	1.02	0.59	0.64	0.86	0.84	0.52
13	1.38	3.35	1.38	1.26	1.20	1.44	3.07	3.06	1.31	4.08	1.25	1.91	1.50	1.04	1.02	0.99	1.15
14	0.98	1.26	0.83	0.89	0.92	2.25	1.30	1.75	0.90	0.92	1.01	1.11	0.78	1.03	0.79	0.64	0.71
A	2.06	1.75	1.75	1.50	1.50	1.75	1.43	1.21	1.38	2.00	1.14	1.31	1.00	1.25	1.00	0.75	0.75
B	1.88	1.60	2.83	2.13	1.94	3.38	2.08	1.67	2.25	5.33	1.42	1.88	1.25	1.88	0.85	1.00	1.00
C	3.63	5.00	2.38	1.75	1.81	3.13	3.86	3.25	3.50	3.33	2.06	2.81	1.25	1.88	1.38	1.25	1.75
F	2.70	10.56	13.31	7.37	4.93	21.12	6.60	5.93	10.81	6.75	3.57	12.04	1.70	1.96	2.15	1.52	1.53
H	1.85	2.58	2.46	1.49	1.54	1.62	1.35	2.22	2.05	2.27	1.84	1.85	1.27	1.48	1.08	0.97	1.13
T	2.35	5.39	2.57	2.42	1.89	2.38	3.69	1.88	2.56	2.80	1.87	2.15	1.67	1.63	1.42	1.72	1.54
N	0.91	0.92	0.77	0.64	0.73	0.72	0.68	0.68	0.91	0.76	0.68	0.82	0.74	0.84	0.82	0.75	0.86
Q	3.96	7.89	4.28	1.75	1.79	2.32	9.51	4.81	3.38	6.71	2.45	3.05	2.26	1.57	1.69	1.52	1.55
U	2.19	3.53	2.34	2.85	2.30	3.81	2.19	2.38	3.00	2.47	2.39	2.87	1.62	1.20	1.32	2.41	1.77
V	3.94	5.88	2.73	1.64	1.50	2.75	4.86	2.80	3.07	3.44	1.56	2.58	0.73	1.27	0.81	1.19	0.72
W	1.10	2.66	1.88	1.28	1.13	2.12	1.24	1.60	2.28	2.33	1.43	1.51	1.72	1.13	1.33	1.55	1.02
Y	2.75	5.69	2.18	1.25	1.25	1.10	3.74	2.15	2.48	5.12	1.43	1.59	0.92	0.92	0.98	0.82	1.53
Z	1.46	2.01	2.29	1.75	2.10	2.32	3.07	2.50	2.72	3.35	1.40	1.44	1.96	1.13	1.15	1.14	1.01
D	1.82	2.68	1.88	2.13	1.70	2.35	3.10	2.18	2.58	2.64	1.76	2.62	1.15	1.36	1.37	1.12	1.24
E	4.36	3.02	4.45	3.35	5.39	7.53	4.55	3.53	6.41	5.10	7.34	3.20	10.51	1.94	2.26	2.22	2.35
G	12.50	6.48	22.28	10.52	12.23	11.66	18.60	15.93	17.94	14.84	9.88	11.61	11.59	4.65	6.27	3.57	2.39
J	4.03	6.27	5.69	3.55	4.00	5.80	4.96	5.24	3.71	5.54	4.27	4.74	4.05	3.70	2.38	3.04	2.41
K	2.38	1.12	1.54	1.26	1.33	1.37	2.28	2.55	2.08	2.98	1.48	1.69	1.18	0.97	0.84	0.92	1.33
L	2.55	2.22	2.54	2.33	2.49	2.22	2.73	3.60	2.65	4.74	2.46	2.64	1.96	2.44	2.27	1.52	1.79
M	3.71	5.82	2.45	1.75	1.68	1.25	2.04	2.71	4.90	3.64	1.91	2.73	1.28	0.99	1.27	1.09	0.96
O	3.49	9.20	7.51	4.10	3.65	8.94	4.85	3.46	4.39	7.04	3.51	4.63	2.18	1.93	2.44	1.58	1.51
P	5.16	6.10	5.40	5.61	9.34	5.02	4.61	8.38	5.43	5.85	5.07	5.60	3.21	1.63	4.08	2.50	2.56
R	5.69	5.84	7.17	5.37	4.75	6.43	5.01	5.21	4.97	5.48	4.20	4.54	1.77	3.76	2.63	4.49	3.19
S	2.51	7.50	2.85	1.62	1.47	1.21	3.86	2.34	1.95	4.48	1.33	2.00	7.71	0.86	0.84	0.91	1.02
T	1.25	2.55	1.79	1.17	0.95	0.86	3.58	1.73	1.66	4.01	1.20	2.16	2.35	0.90	1.02	1.51	0.83
X	2.92	6.34	5.38	4.52	4.32	4.23	2.45	3.26	3.61	6.10	3.36	3.10	1.32	1.44	1.74	1.39	1.18
ZZ	6.36	10.90	6.53	2.22	2.08	2.38	7.56	3.67	5.61	4.97	6.33	4.30	2.25	1.91	1.46	2.91	1.37

TABLE C2-6

Analysis of variance summary tables for response latency for individual transformations in the Complex Discrimination task. All response latencies were logarithmically transformed prior to analysis

(i) Global-size

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.422	2	.211	7.819	0.0014
Within groups	1.026	38	.027		

(ii) Component-size

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.144	2	.072	1.352	0.27
Within groups	2.019	38	.053		

(iii) Global-orientation-15°

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.507	2	.254	5.532	0.0078
Within groups	1.743	38	.046		

TABLE C2-6 (continued)

(iv) Global-orientation-90°

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.376	2	.188	6.798	.0030
Within groups	1.050	38	.028		

(v) Global-orientation-180°

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.467	2	.233	7.888	.0014
Within groups	1.124	38	.030		

(vi) Global-reflection

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.459	2	.230	4.543	.0170
Within groups	1.921	38	.051		

TABLE C2-6 (continued)

(vii) Component-orientation-15°

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.272	2	.136	3.302	.0476
Within groups	1.568	38	.041		

(viii) Component-orientation-hv/o

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.389	2	.194	6.911	.0028
Within groups	1.069	38	.028		

(ix) Global-translation

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.388	2	.194	5.334	.0091
Within groups	1.380	38	.036		

TABLE C2-6 (continued)

(x) Component-translation

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.285	2	.143	2.814	.0725
Within groups	1.926	38	.051		

(xi) Global-structural

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.465	2	.232	10.882	.0002
Within groups	.811	38	.021		

(xii) Component-structural

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.283	2	.142	4.282	.0210
Within groups	1.257	38	.033		

TABLE C2-6 (continued)

(xiii) Open

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.589	2	.295	10.422	.0002
Within groups	1.074	38	.028		

(xiv) One distinguishing-feature

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.135	2	.067	5.126	.0107
Within groups	.499	38	.013		

(xv) One distinguishing-feature and open

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.192	2	.096	7.321	.0020
Within groups	.498	38	.013		

TABLE C2-6 (continued)

(xvi) Two distinguishing-features

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.183	2	.092	8.422	.0009
Within groups	.413	38	.011		

(xvii) Two distinguishing-features and open

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	.125	2	.062	7.993	.0013
Within groups	.296	38	.008		

TABLE C2-7

Summary of Kruskal-Wallis analyses of variance
of response latency for individual transformation
types (Complex Discrimination task)

Transformation	χ^2 (corrected for ties)	<i>p</i>
Global-size	12.381	.002
Component-size	2.817	.245
Global-orient.-15°	8.455	.015
" " 90°	10.498	.005
" " 180°	10.131	.006
Component-orient.-15°	5.657	.059
" " hv/o	11.857	.003
Global-translation	10.016	.007
Component-translation	9.372	.009
Global-structural	12.968	.002
Component-structural	9.239	.010
Open	14.674	.001
One dist.-feature	9.470	.009
One dist.-feature + open	9.029	.011
Two dist.-feature	10.156	.006
Two dist.-feature + open	10.800	.005

APPENDIX D

AN APPENDIX TO CHAPTER 6

APPENDIX D1: ORIENTATION APPARATUS

An orientation sheet containing a Standard and two Comparison lines, each located in separate 6" x 4" (15.2 cm x 10.2 cm) frames, was constructed for each Distractor item of each Standard (see Figure D1 (i)). The Standard frame was separated from the upper¹ comparison frame by 1" (2.5 cm) and the Comparison frames were separated from each other by $\frac{1}{2}$ " (1.3 cm). The stimuli were then placed in an "apparatus" that consisted of two 16" x 16" (40.6 x 40.6 cm) square black cards which were hinged at one side. The upper square card of the apparatus contained three 3" (7.6 cm) diameter circular windows. The lower square card contained a right-angled frame. Its sides were parallel to the sides of the card and it was designed to accommodate the three stimuli (Figure D1 (ii)). When the stimuli were placed in the frame and behind the top windowed card, the centre of each line coincided with the centre of each circular window. The rectangular frames were no longer visible (see Figure D (iii)). The immediate surround was circular in an attempt to minimize discrimination strategies based on distance judgments (as the orientation of a line in a small square or rectangular surround changes, the shortest distance between the end point of the line and the frame also changes).

¹Refers to position on the horizontal plane. All other references to upper (lower, top) refer to positions in the fronto-parallel plane.

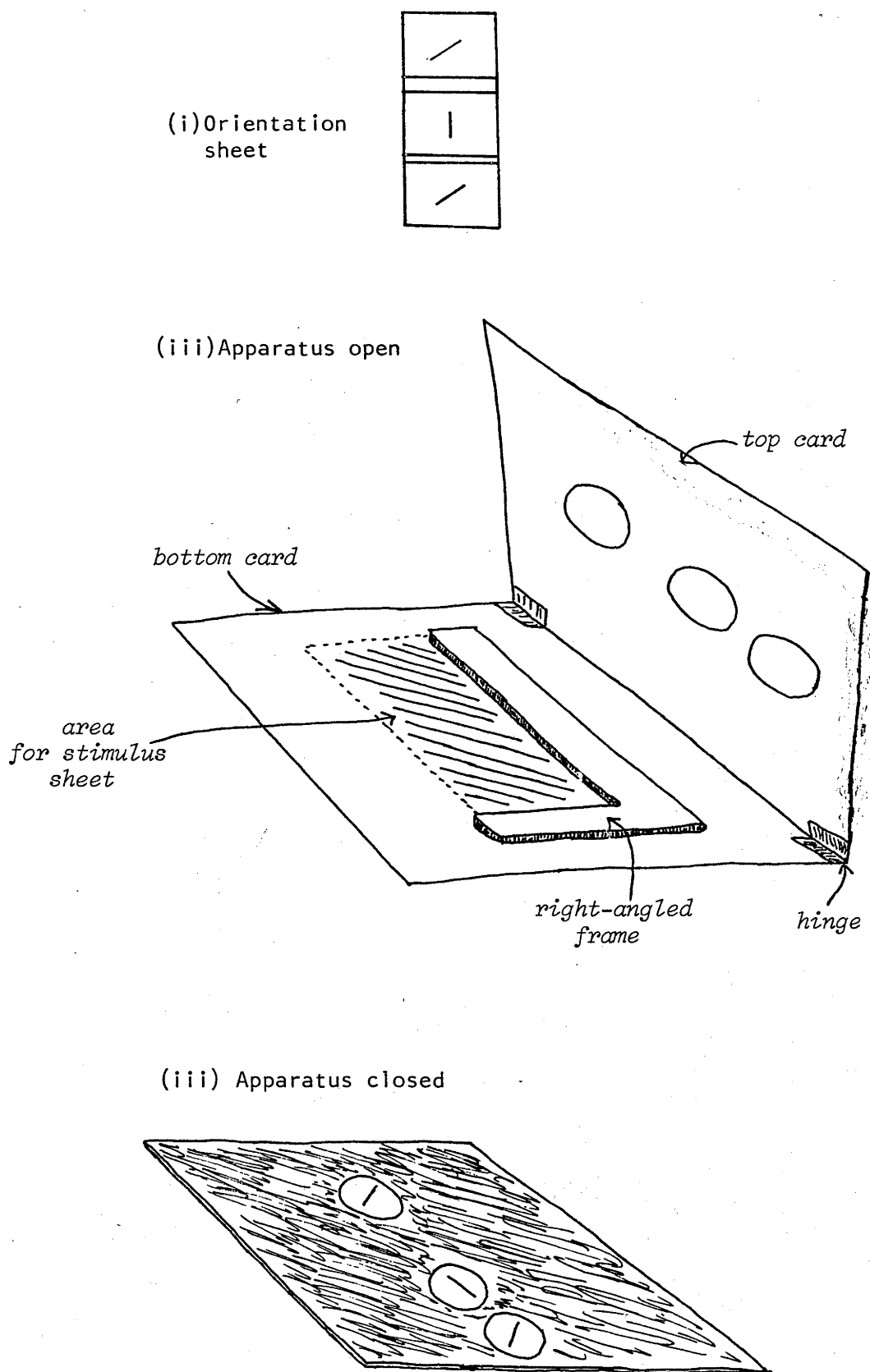


Figure D1. Orientation apparatus (sketch only, not to scale).

APPENDIX D2: DISTRACTOR PRESENTATION ORDER FOR ELEMENTARY ATTRIBUTE
DISCRIMINATION TESTS

The distractors were presented in order of decreasing difficulty. However, for those distractors generated by equal absolute transformations of the Standard, the following orders of presentation were chosen.

- SIZE : Positive log deviation (larger than Standard) preceded equivalent negative log deviation (smaller than Standard).
- ORIENTATION : Clockwise deviation preceded anti-clockwise deviation.
- ANGLE : Angle larger than Standard preceded Angle smaller than Standard.
- POSITION : The order employed for a given displacement was vertical upward; vertical downward; diagonal towards nearest corner; diagonal away from nearest corner; rightward; leftward.

APPENDIX D3: DATA AND ANALYSES FOR THE PERCEPTUAL AND MOTOR FORMS OF THE SIZE ATTRIBUTE TASK

TABLE D3-1

Mean size error¹ for each task form for each subject

GROUP	Subject	TASK FORM	
		Motor	Perceptual
CONTROL	1	0.082	0.147
	2	0.122	0.050
	3	0.117	0.040
	4	0.173	0.127
	5	0.192	0.130
	6	0.075	0.000
	7	0.370	0.200
	8	0.277	0.000
	9	0.145	0.235
	10	0.233	0.135
	11	0.110	0.110
	12	0.205	0.140
	13	0.158	0.040
	14	0.217	0.167
<u>GCD</u>	A	0.192	0.247
	B	0.205	0.123
	C	0.077	0.050
	F	0.232	0.110
	H	0.200	0.113
	I	0.117	0.223
	N	0.050	0.090
	Q	0.317	0.213
	U	0.190	0.323
	V	0.095	0.297
	W	0.063	0.227
	Y	0.178	0.143
	Z	0.193	0.380
GCD	D	0.167	0.057
	E	0.838	0.360
	G	0.232	0.363
	J	0.180	0.490
	K	0.130	0.300
	L	0.650	0.353
	M	0.140	0.447
	O	0.235	0.340
	P	0.140	0.177
	R	0.815	0.310
	S	0.175	0.180
	T	0.173	0.070
	X	0.298	0.177
	ZZ	0.202	0.320

$$^1 \text{Size error} = \log_2 \left(\frac{x}{\text{Standard Size}} \right)$$

where x = size of copy or size of most deviant incorrect distractor

TABLE D3-2
 Summary table for analysis of variance
 (split-plot, least squares solution) of
 Size error

Source	SS	<i>df</i>	MS	<i>F</i>
Between Ss	1.203	40		
Groups	0.364	2	0.182	8.231**
Ss w/in Gps	0.839	38	0.022	
Within Ss	0.610	41		
Task Form	0.011	1	0.011	0.751
Groups x Task Form	0.035	2	0.018	1.185
Task Form x Ss w/in Gps	0.564	38	0.015	

**
 $p < .01$

APPENDIX D4: DATA AND ANALYSES FOR THE PERCEPTUAL AND MOTOR FORMS OF THE ORIENTATION

ATTRIBUTE TASK

TABLE D4-1

Mean orientation error (in degrees) for each task form

Group	Subject	TASK FORM	
		Motor	Perceptual
CONTROL	1	3.70	3.66
	2	2.10	2.00
	3	2.00	0.66
	4	2.70	3.00
	5	2.86	1.00
	6	6.08	4.67
	7	4.20	3.00
	8	5.03	2.33
	9	3.20	1.33
	10	4.76	3.67
	11	4.07	3.33
	12	2.48	2.33
	13	3.14	3.67
	14	6.01	4.33
GCD	A	4.10	5.00
	B	2.70	4.00
	C	6.10	5.00
	F	5.60	12.34
	H	2.30	3.00
	I	5.60	8.00
	N	3.30	3.34
	Q	3.53	2.00
	U	3.33	3.00
	V	4.29	2.33
	W	2.13	2.67
	Y	5.02	2.67
	Z	5.30	4.33
GCD	D	3.10	5.00
	E	10.60	6.66
	G	4.40	4.34
	J	5.60	6.66
	K	4.30	3.34
	L	5.90	6.66
	M	5.98	11.00
	O	4.45	7.33
	P	5.42	11.33
	R	6.61	10.00
	S	5.28	2.00
	T	10.16	6.67
	X	9.43	6.33
	ZZ	4.42	5.00

TABLE D4-2

Summary table for analysis of variance (split-plot,
least squares solution) of Orientation error

Source	SS	df	MS	F
Between Ss	362.770	40		
Groups	139.286	2	69.643	11.842**
Ss w/in Gps	223.483	38	5.881	
Within Ss	113.714	41		
Task Form	0.065	1	0.065	0.023
Groups x Task Form	8.627	2	4.314	1.561
Task Form x Ss w/in Gps	105.023	38	2.764	

**
 $p < .01$

APPENDIX D5: DATA AND ANALYSES FOR THE PERCEPTUAL AND MOTOR FORMS OF THE POSITION ATTRIBUTE TASK

TABLE D5-1

Mean position error (mm) for each task form

TASK FORM			
GROUP	Subject	Motor	Perceptual
CONTROL	1	4.52	4.32
	2	3.41	2.54
	3	2.96	2.54
	4	7.31	5.08
	5	4.74	4.32
	6	3.33	5.08
	7	6.18	4.32
	8	5.79	2.54
	9	3.22	5.08
	10	3.13	4.32
	11	4.06	5.84
	12	3.34	4.32
	13	2.74	6.86
	14	4.05	5.08
<u>GCD</u>	A	4.12	8.38
	B	3.50	4.32
	C	4.64	15.24
	D	3.60	6.86
	E	3.70	2.54
	F	6.14	13.46
	G	5.41	6.86
	H	4.29	4.32
	I	6.54	10.16
	J	5.44	4.32
	K	4.93	3.30
	L	4.98	2.54
	M	7.62	8.38
GCD	D	4.17	5.84
	E	16.84	20.32
	G	20.32	13.46
	J	8.41	15.24
	K	6.65	8.38
	L	6.74	6.86
	M	6.55	11.94
	O	5.00	5.84
	P	10.55	10.16
	R	20.01	17.02
	S	5.19	8.38
	T	6.59	4.32
	X	6.49	5.08
	ZZ	7.31	8.38

TABLE D5-2

Summary table for analysis of variance (split-plot,
least squares solution) of Position error

Source	SS	df	MS	F
Between Ss	1201.893	40		
Groups	426.278	2	213.139	10.442 ^{**}
Ss w/in Gps	775.615	38	20.411	
Within Ss	220.780	41		
Task Form	19.153	1		3.812
Groups x Task Form	10.680	2		1.063
Task Form x Ss w/in Gps	190.948	38		

^{**}
 $p < .01$

APPENDIX D6: DATA AND ANALYSES FOR THE PERCEPTUAL AND MOTOR FORMS OF THE ANGLE ATTRIBUTE TASK

TABLE D6-1

Mean angle error (degrees) for each task
form

TASK FORM			
GROUP	Subject	Motor	Perceptual
CONTROL	1	15.81	8.70
	2	7.25	2.00
	3	8.13	1.50
	4	6.69	2.50
	5	5.75	3.00
	6	10.00	4.67
	7	11.56	4.00
	8	13.88	8.00
	9	6.06	2.00
	10	15.75	10.00
	11	7.25	6.00
	12	6.88	6.50
	13	4.75	10.50
	14	13.81	4.50
<u>GCD</u>	A	11.38	5.00
	B	12.01	7.00
	C	13.85	3.00
	F	8.61	8.50
	H	6.10	2.50
	I	13.73	8.00
	N	7.10	2.00
	Q	8.14	7.00
	U	8.31	5.00
	V	15.13	5.50
	W	7.50	4.50
	Y	8.00	5.00
	Z	11.88	6.50
GCD	D	13.70	5.50
	E	25.46	16.00
	G	21.25	17.00
	J	8.91	5.50
	K	8.35	11.00
	L	14.66	20.00
	M	12.22	8.00
	O	13.94	22.00
	P	17.82	6.00
	R	15.50	6.00
	S	12.94	7.00
	T	6.69	10.00
	X	19.94	3.50
	ZZ	12.19	12.00

TABLE D6-2

Summary table for analysis of variance (split-plot,
least squares solution) of Angle error

Source	SS	df	MS	F
Between Ss	1283.426	40		
Groups	470.139	2	235.07	10.983**
Ss w/in Gps	813.287	38	21.40	
Within Ss	848.421	41		
Task Form	377.799	1	377.799	30.694**
Groups x Task Form	2.896	2	1.448	0.118
Task Form x Ss w/in Gps	467.726	38	12.309	

**
 $p < .01$

APPENDIX D7: DATA AND ANALYSES FOR THE PERCEPTUAL AND MOTOR FORMS OF THE DOT-CONNECTION TASK

TABLE D7-1
Mean direction error (in degrees) for each task form

TASK FORM			
GROUP	Subject	Motor	Perceptual
CONTROL	1	-	-
	2	3.5	0.97
	3	3.4	0.97
	4	3.6	0.0
	5	5.7	0.97
	6	3.0	1.93
	7	3.4	1.93
	8	7.5	5.20
	9	2.9	0.97
	10	3.2	0.97
	11	5.3	2.0
	12	4.5	2.7
	13	5.0	0.97
	14	3.4	0.97
<u>GCD</u>	A	-	-
	B	2.8	0.97
	C	3.2	3.2
	D	-	-
	E	4.2	1.9
	F	3.4	0.0
	G	5.7	1.9
	H	2.9	1.9
	I	1.7	1.9
	J	2.1	3.7
	K	3.5	2.0
	L	3.5	0.97
	M	-	-
	N	-	-
GCD	D	4.6	2.9
	E	15.2	8.5
	G	6.3	5.7
	J	4.4	10.3
	K	9.5	0.97
	L	10.6	3.5
	M	4.6	0.97
	O	6.2	4.1
	P	12.7	3.6
	R	6.0	4.4
	S	4.5	1.9
	T	10.4	1.9
	X	8.4	0.97
	ZZ	4.8	2.0

TABLE D7-2

Summary table for analysis of variance (split-plot,
least squares solution) of Direction error

Source	SS	df	MS	F
Between Ss	346.354	36		
Groups	153.947	2	76.974	13.60 ^{**}
Ss w/in Gps	192.406	34	5.569	
Within Ss	299.615	37		
Task Form	148.703	1	148.703	38.60 ^{**}
Groups x Task Form	19.936	2	9.968	2.59
Task Form x Ss w/in Gps	130.977	34	3.852	

^{**}
 $p < .01$

APPENDIX E

AN APPENDIX TO CHAPTER 7

APPENDIX E: DATA AND ANALYSES FOR THE RELATIVE-SIZE PRODUCTION TASK

TABLE E-1

Mean difference between obtained and target
proportions for the Control and Experimental
conditions of the Relative-size production
task

TASK FORM			
Group	Subject	Control	Experimental
CONTROL	1	0.045	0.118
	2	.030	.028
	3	.023	.030
	4	.028	.060
	5	.040	.040
	6	.043	.060
	7	.055	.053
	8	.038	.049
	9	.033	.073
	10	.058	.079
	11	.033	.043
	12	.038	.040
	13	.038	.033
	14	.028	.068
<u>GCD</u>	A	.048	.056
	B	.058	.073
	C	.040	.056
	D	.025	.064
	E	.035	.048
	F	.033	.053
	G	.028	.023
	H	.043	.069
	I	.083	.122
	J	.033	.041
	K	.035	.038
	L	.040	.055
	M	.038	.065
GCD	D	0.060	.078
	E	.050	.233
	G	.048	.170
	J	.130	.278
	K	.100	.065
	L	.075	.108
	M	.038	.030
	O	.055	.083
	P	.083	.165
	R	.225	.426
	S	.058	.039
	T	.040	.120
	X	.103	.099
	ZZ	.045	.051

TABLE E-2

Summary table for analysis of variance (split-plot,
least-squares solution) of Relative-size error

Source	SS	df	MS	F
Between Ss	0.233	40		
Groups	0.068	2	0.034	7.90 ^{**}
Ss w/in Gps	0.165	38	0.004	
Within Ss	0.072	41		
Condition	0.021	1	0.021	18.24 ^{**}
Groups X Condition	0.008	2	0.004	3.64 [*]
Condition X Ss w/in Gps	0.043	38	0.001	

TABLE E-3

- (i) Summary of table for analysis of variance (one-way) of error for the Control condition of the Relative-size task

Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	0.015	2	0.007	7.597	.0017
Within groups	0.037	38	0.001		

- (ii) Summary table for analysis of variance (one-way) of error for the Experimental condition of the Relative-size task

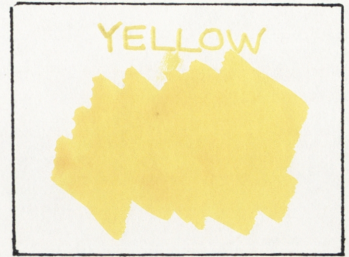
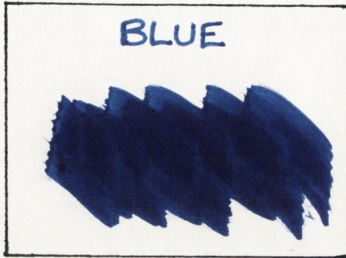
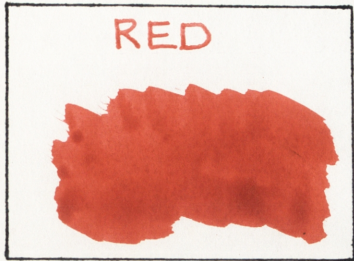
Source	SS	<i>df</i>	MS	<i>F</i>	<i>p</i>
Between groups	0.062	2	0.031	6.89	.0028
Within groups	0.171	38	0.005		

APPENDIX F

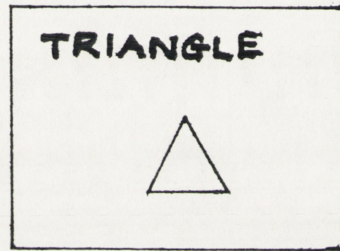
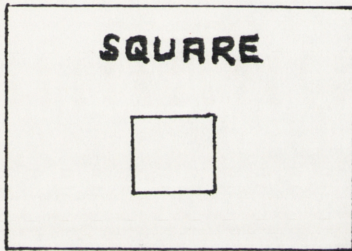
AN APPENDIX TO CHAPTER 8

APPENDIX F1: CUE CARDS EMPLOYED IN THE SINGLE ATTRIBUTE SORTING TASK.
(Scale 1:1.5)

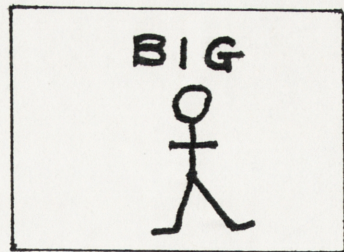
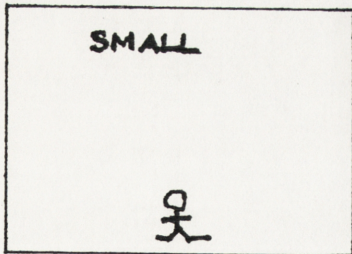
(i) Colour



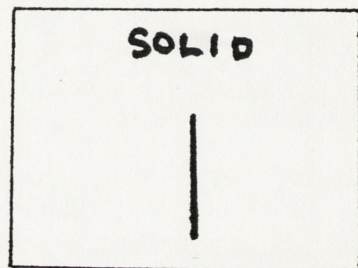
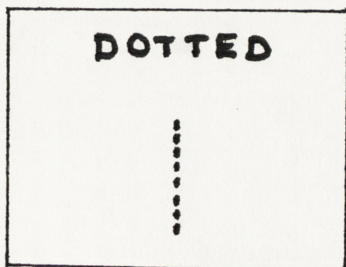
(ii) Shape



(iii) Size



(iv) Contour



APPENDIX F2: DATA FOR MULTIPLE- AND SINGLE-ATTRIBUTE TESTS

TABLE F2-1
Numbers of errors for the Single- and Multiple-Attribute
tests

	Single-Attribute Test				Multiple-Attribute Test
	Colour	Size	Shape	Contour	
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
A	0	0	0	0	0
B	0	0	0	0	0
C	-	-	-	-	-
D	0	0	0	0	0
E	0	0	0	0	0
F	0	0	0	0	0
G	0	0	0	0	0
H	0	0	0	0	0
I	0	0	0	0	0
J	0	0	0	0	0
K	0	0	0	0	0
L	0	0	0	0	0
M	0	0	0	0	0
N	0	0	0	0	0
O	0	0	0	0	0
P	0	0	0	0	0
Q	0	0	0	0	0
R	0	0	0	0	0
S	0	0	0	0	0
T	0	0	0	0	0
U	0	0	0	0	0
V	0	0	0	0	0
W	0	0	0	0	0
X	0	0	0	0	0
Y	0	0	0	0	0
Z	0	0	0	0	0
D	0	0	0	0	0
E	0	0	0	0	1 (omission)
G	-	-	-	-	-
J	0	0	0	0	0
K	0	0	0	0	0
L	1	0	0	0	2
M	1	0	0	0	7
O	0	0	0	0	1
P	0	0	0	0	11
R	0	10	0	1	3
S	0	0	0	0	0
T	0	0	0	0	0
X	0	12	0	0	10
ZZ	0	0	0	0	0

- Note:
1. Maximum possible error for each cell is 24
 2. The test was not administered to Subject C nor subject G
 3. Except where indicated, all errors on the Multiple-attribute task refer to "confusion" errors (see text).

APPENDIX G

AN APPENDIX TO CHAPTER 9

APPENDIX G1: DATA AND ANALYSES FOR VISUAL MATCHING TEST

TABLE G1-1
Error for the Visual Matching test

Control Group		$\overline{\text{GCD}}$	Group	$\overline{\text{GCD}}$	Group
Subject Error		Subject Error		Subject Error	
1	1	$\bar{A}$	0	D	1
2	0	$\bar{B}$	0	E	3
3	0	$\bar{C}$	0	G	1
4	2	$\bar{F}$	1	J	1
5	0	$\bar{H}$	0	K	2
6	0	$\bar{I}$	0	L	5
7	0	$\bar{N}$	3	M	3
8	0	$\bar{Q}$	0	O	4
9	1	$\bar{J}$	2	P	0
10	0	$\bar{V}$	0	R	0
11	0	$\bar{W}$	2	S	1
12	1	$\bar{Y}$	0	T	0
13	3	$\bar{Z}$	1	X	3
14	5			ZZ	1

TABLE G1-2
Mean correct-response latency for the Visual Matching
test

Control Group		GCD	Group	GCD	Group
Subject Error		Subject Error		Subject Error	
1	4.6	$\bar{A}$	5.0	D	3.9
2	-	$\bar{B}$	4.1	E	10.9
3	2.9	$\bar{C}$	5.1	G	7.6
4	3.1	$\bar{F}$	4.8	J	11.5
5	4.0	$\bar{H}$	3.9	K	3.1
6	4.2	$\bar{I}$	6.7	L	5.3
7	2.4	$\bar{N}$	2.6	M	10.1
8	3.7	$\bar{Q}$	5.5	O	8.6
9	4.2	$\bar{U}$	3.2	P	8.5
10	4.4	$\bar{V}$	13.1	R	8.8
11	5.7	$\bar{W}$	3.7	S	3.5
12	2.8	$\bar{Y}$	3.2	T	4.3
13	3.5	$\bar{Z}$	4.0	X	6.6
14	3.5			ZZ	4.0

TABLE G1-3

Summary table for analysis of variance of
mean response latencies for Visual Matching
test

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.267	2	0.134	6.928
Within groups	0.713	37	0.019	
Total	0.980			

Note: A logarithmic transformation was applied to each score before analysis.

APPENDIX G2: DATA AND ANALYSES FOR VISUAL SEARCH TEST

Table G2-1

Mean correct-response latency (msecs) for Visual Search test

Group	Subject	CONDITION		
		1 (Multiple)	2 (Central)	3 (Lateral)
Control	1	1246.50	549.29	673.75
	2	1385.63	573.00	530.38
	3	698.38	259.25	413.88
	4	1017.00	347.00	493.00
	5	1418.88	582.13	833.25
	6	1550.75	796.00	1081.00
	7	1310.56	541.50	574.75
	8	880.50	299.00	582.75
	9	1434.75	465.00	691.38
	10	2181.75	966.50	1435.13
	11	1546.88	609.00	1045.25
	12	1650.13	371.75	609.75
	13	1565.75	553.25	681.88
	14	1409.13	452.75	765.50
GCD	A	1703.25	522.86	935.88
	B	1828.13	540.63	800.63
	C	1374.50	483.38	673.89
	F	3277.80	739.13	2088.13
	H	1828.50	640.89	721.63
	I	792.75	708.25	1125.25
	N	474.25	507.44	369.50
	Q	1613.00	563.25	860.88
	U	2487.00	493.00	1219.75
	V	6043.83	2076.38	1928.25
	W	1353.80	1284.24	934.63
	Y	2532.00	825.25	865.75
	Z	3322.88	1580.43	1646.88
GCD	D	1386.67	656.88	738.63
	E	3446.00	1539.25	2396.00
	G	-	-	-
	J	4997.00	3374.38	3533.13
	K	408.13	326.25	427.38
	L	2488.38	1324.75	2635.38
	M	1172.78	725.63	1000.63
	O	1497.63	1003.50	1207.88
	P	2890.00	1601.88	1990.50
	R	1397.25	937.75	994.13
	S	1582.50	680.14	731.00
	T	5737.00	2086.14	2322.50
	X	-	-	-
	ZZ	1022.00	458.75	560.25

TABLE G2-2

Summary table for analysis of variance (split-plot,
least-squares solution) of response latency for
Visual Search test

Source	SS	<i>df</i>	MS	<i>F</i>
Between Ss	78289149.4	38		
Groups	13377640.4	2	6688820.2	3.71*
Ss w/in Gps	64911509.0	36	1803097.5	
Within Ss	44825536	78	12908095.0	
Condition	2581619.0	2	282048.7	51.98**
Groups x Condition	1128194.7	4	248349.3	1.14
Condition x Ss w/in Gps	17881150.3	72		

TABLE G3-2

Number of patterns omitted in Visual Scanning test
(cumulated across items)

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	f	Subject	f	Subject	f
1	0	$\bar{A}$	1	D	0
2	0	$\bar{B}$	0	E	1
3	0	$\bar{C}$	0	G	1
4	0	$\bar{F}$	0	J	0
5	0	$\bar{H}$	0	K	0
6	0	$\bar{I}$	0	L	1
7	0	$\bar{N}$	0	M	0
8	0	$\bar{Q}$	0	O	0
9	0	$\bar{U}$	0	P	0
10	0	$\bar{V}$	2	R	1
11	0	$\bar{W}$	0	S	0
12	0	$\bar{Y}$	0	T	1
13	0	$\bar{Z}$	0	X	1
14	0			ZZ	1

APPENDIX G4: DATA FOR COMPONENTS CORRESPONDENCE TEST

(i) OMISSION

The following subjects from each group made one or more omission errors on the Components Correspondence test.

CONTROL GROUP: Subject 9 (1 error)

GCD GROUP : No subject made an error

GCD GROUP : Subjects E (3 errors), G (2 errors), L (1 error),
M (1 error), X (2 errors)

(ii) MISMATCH

The following subject from each group made one mismatch error on the Components Correspondence test.

CONTROL GROUP: No subject made an error

GCD GROUP : No subject made an error

GCD GROUP : Subject M, Subject X

(iii) "UNSYSTEMATIC" SCANNING*

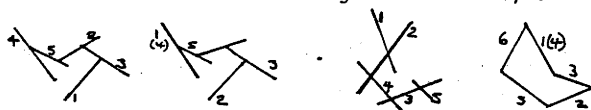
The following subjects showed some evidence of unsystematic scanning

CONTROL GROUP: Subjects 6 (2 errors), 9 (1 error), 10 (1 error),
11 (1 error)

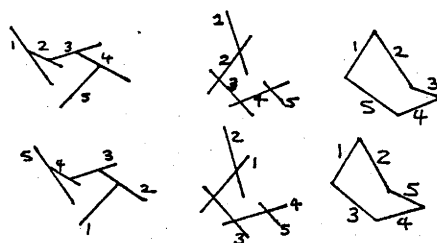
GCD GROUP : Subjects $\bar{A}$ (1 error), $\bar{F}$ (1 error), $\bar{I}$ (1 error), $\bar{U}$ (1 error)

GCD GROUP : Subjects D (1 error), E (1 error), G (2 errors), K (1 error),
M (2 errors), O (1 error), P (3 errors), R (1 error),
X (1 error)

* Examples of orders which were categorized as "unsystematic".



Examples of orders which were categorized as "systematic".



APPENDIX H

AN APPENDIX TO CHAPTER 10

APPENDIX H: RESULTS FOR THE VERBAL PLANNING TEST

TABLE H
Error scores* (combined for items 1 and 2) for
the Verbal Planning test

Control Group		GCD	Group		GCD	Group	
Subject Error		Subject	Error		Subject	Error	
1	4	$\bar{A}$	1		D	3	
2	1	$\bar{B}$	3		E	4	
3	0	$\bar{C}$	$\frac{1}{2}$		G	6	
4	0	$\bar{F}$	$\frac{1}{2}$		J	$4\frac{1}{2}$	
5	$\frac{1}{2}$	$\bar{H}$	0		K	$1\frac{1}{2}$	
6	1	$\bar{I}$	2		L	9	
7	0	$\bar{N}$	2		M	-	
8	$1\frac{1}{2}$	$\bar{Q}$	0		O	5	
9	1	$\bar{U}$	0		P	$4\frac{1}{2}$	
10	$\frac{1}{2}$	$\bar{V}$	-		R	6	
11	$2\frac{1}{2}$	$\bar{W}$	$\frac{1}{2}$		S	3	
12	0	$\bar{Y}$	2		T	-	
13	1	$\bar{Z}$	$2\frac{1}{2}$		X	-	
14	2				ZZ	1	

* (Based on occurrence of reversals in instructions. For example,

124356, scored 1 error point as did 124536

124365, scored 2 error points as did 123654

Some reversals were scored only $\frac{1}{2}$ an error point. For example, in item 1 (dress making), buying material before selecting a pattern was scored a $\frac{1}{2}$ error point).

APPENDIX I

AN APPENDIX TO CHAPTER 11

TABLE 11-1
Percentage of subjects from each criterion group observing
direction rules for each single line stimulus

DESIGN AND DIRECTION RULE						
	 No. 31	 No. 36	 No. 35	 No. 33	 No. 34	 No. 32
Control	100% (N=12)	100% (N=12)	100% (N=12)	100% (N=12)	25% (N=12)	15.4% (N=13)
<u>GCD</u>	100% (N=11)	100% (N=11)	100% (N=13)	100% (N=12)	38.5% (N=13)	7.7% (N=12)
GCD	100% (N=13)	100% (N=14)	100% (N=12)	100% (N=12)	67.7% (N=12)	30.8% (N=13)

Direction rules

-  Proceed from left to right
-  Proceed from top to bottom
-  Proceed from left top to right bottom
-  Proceed from right top to left bottom

Note: Design numbers refer to Copying test, Chapter 4.

TABLE 11-2
 Percentage of subjects from each criterion group observing five
 common direction rules for seven double-line stimuli

DESIGN	GROUP	RULE				
		(1) Left start	(2) Top start	(3) All horizontal →	(4) All vertical ↓	(5) Thread
	Control	91.7% (N=12)	100% (N=12)	91.7% (N=12)	100% (N=12)	91.7% (N=12)
	GCD	100% (N=12)	100% (N=12)	100% (N=12)	100% (N=12)	100% (N=12)
	No. 37 GCD	100% (N=11)	100% (N=11)	100% (N=11)	100% (N=11)	100% (N=11)
	Control	100% (N=13)	100% (N=13)	100% (N=13)	100% (N=13)	100% (N=13)
	GCD	100% (N=12)	100% (N=12)	100% (N=12)	100% (N=12)	100% (N=12)
	No. 40 GCD	100% (N=11)	100% (N=11)	100% (N=11)	100% (N=11)	100% (N=11)
	Control	76.9% (N=13)	100% (N=13)	76.9% (N=13)	100% (N=13)	23.1% (N=13)
	GCD	92.3% (N=13)	61.5% (N=13)	92.3% (N=13)	61.5% (N=13)	46.2% (N=13)
	No. 38 GCD	38.5% (N=13)	92.3% (N=13)	38.5% (N=13)	92.3% (N=13)	69.2% (N=13)
	Control	23.1% (N=13)	76.9% (N=13)	38.5% (N=13)	100% (N=13)	76.9% (N=13)
	GCD	36.4% (N=11)	90.9% (N=11)	36.4% (N=11)	90.9% (N=11)	72.7% (N=11)
	No. 39 GCD	35.7% (N=14)	64.3% (N=14)	35.7% (N=14)	78.6% (N=14)	92.3% (N=13)
	Control	76.9% (N=13)	23.1% (N=13)			76.9% (N=13)
	GCD	57.1% (N=14)	42.9% (N=14)			57.1% (N=14)
	No. 41 GCD	69.2% (N=13)	30.8% (N=13)			69.2% (N=13)
	Control	100% (N=13)	100% (N=13)	100% (N=13)		100% (N=13)
	GCD	100% (N=11)	100% (N=11)	100% (N=11)		100% (N=11)
	No. 42 GCD	100% (N=12)	100% (N=12)	100% (N=12)		100% (N=12)
	Control	81.8% (N=11)	18.2% (N=11)	100% (N=13)		81.8% (N=11)
	GCD	81.8% (N=11)	18.2% (N=11)	100% (N=11)		100% (N=11)
	No. 43 GCD	71.4% (N=14)	28.6% (N=14)	85.7% (N=14)		85.7% (N=14)

Note: Design numbers refer to Copying test, Chapter 4.

TABLE 11-3
 Percentage of subjects from each criterion group observing the
 common direction rules for each of four familiar geometrical
 figures

DESIGN	GROUP	RULE				
		(1) Left start	(2) Top start	(3) All horizontal →	(4) All vertical ↓	(5) Thread
	Control	100% (N=12)	100% (N=12)	50% (N=12)	41.7% (N=12)	41.7% (N=12)
	GCD	92.3% (N=13)	92.3% (N=13)	61.5% (N=13)	53.8% (N=13)	38.5% (N=13)
	No. 3	92.9% (N=14)	100% (N=14)	35.7% (N=14)	42.9% (N=14)	42.9% (N=14)
	Control	41.7% (N=12)	58.3% (N=12)	76.9% (N=13)		8.3% (N=12)
	GCD	45.5% (N=11)	54.5% (N=11)	72.7% (N=11)		36.4% (N=11)
	No. 1	8.3% (N=12)	91.7% (N=13)	91.7% (N=12)		16.7% (N=12)
	Control	90% (N=10)	100% (N=10)	60% (N=10)		20% (N=10)
	GCD	90% (N=10)	90% (N=10)	80% (N=10)		40% (N=10)
	No. 2	100% (N=12)	100% (N=12)	91.7% (N=12)		25% (N=12)
	Control	75% (N=12)	25% (N=12)			25% (N=12)
	GCD	60% (N=10)	30% (N=10)			30% (N=10)
	No. 4	36.4% (N=11)	54.5% (N=11)			36.4% (N=11)

Note: Design numbers refer to Copying test, Chapter 4.

TABLE 11-4

Percentage of subjects from each criterion group observing four common
direction rules for five 3-D designs

(a) excluding copies showing marked change in shape and (b) including copies showing marked change
in shape.

DESIGN	GROUP	RULE			
		(1) Left start	(2) Top start	(3) All horizontal →	(4) All vertical ↓
 No. 25	(a) Control	72.7% (N=11)	9.1% (N=11)	63.6% (N=11)	72.7% (N=11)
	GCD	83.3% (N=12)	8.3% (N=12)	66.7% (N=12)	75% (N=12)
	GCD +	80% (N=5)	20% (N=5)	40% (N=5)	80% (N=5)
	(b) Control	66.7% (N=12)	16.7% (N=12)	66.7% (N=12)	75% (N=12)
	GCD	83.3% (N=12)	8.3% (N=12)	66.7% (N=12)	75% (N=12)
	GCD +	83.3% (N=12)	50% (N=12)	33.0% (N=12)	58.3% (N=12)
 No. 26	(a) Control	63.6% (N=11)	63.6% (N=11)	63.6% (N=11)	81.8% (N=11)
	GCD	36.4% (N=11)	27.3% (N=11)	54.5% (N=11)	72.7% (N=11)
	GCD +	42.9% (N=7)	42.9% (N=7)	42.9% (N=7)	42.9% (N=7)
	(b) Control	61.5% (N=13)	61.5% (N=13)	61.5% (N=13)	76.9% (N=13)
	GCD	41.7% (N=12)	33.3% (N=12)	50% (N=12)	75% (N=12)
	GCD +	53.8% (N=13)	46.2% (N=12)	33.3% (N=12)	41.7% (N=12)
 No. 22	(a) Control	45.5% (N=11)	45.5% (N=11)	80% (N=10)	
	GCD	23.1% (N=13)	76.9% (N=13)	100% (N=13)	
	GCD +	10% (N=10)	100% (N=10)	81.8% (N=11)	
	(b) Control	45.5% (N=11)	45.5% (N=11)	80% (N=10)	
	GCD	23.1% (N=13)	76.9% (N=13)	100% (N=13)	
	GCD +	8.3% (N=12)	91.7% (N=12)	76.9% (N=13)	
 No. 24	(a) Control	36.4% (N=11)	63.6% (N=11)	81.8% (N=11)	
	GCD	41.7% (N=12)	50% (N=12)	75% (N=12)	
	GCD +	10% (N=10)	63.6% (N=11)	40% (N=10)	
	(b) Control	36.4% (N=11)	63.6% (N=11)	81.8% (N=11)	
	GCD	41.7% (N=12)	50% (N=12)	75% (N=12)	
	GCD +	28.6% (N=14)	78.6% (N=14)	40% (N=14)	
 No. 23	(a) Control	0% (N=12)	8.3% (N=12)	75% (N=12)	
	GCD	41.7% (N=12)	0% (N=12)	100% (N=12)	
	GCD +	0% (N=12)	25% (N=12)	83.3% (N=12)	
	(b) Control	0% (N=12)	8.3% (N=12)	75% (N=12)	
	GCD	41.7% (N=12)	0% (N=12)	100% (N=12)	
	GCD +	7.1% (N=14)	21.4% (N=14)	71.4% (N=14)	

Note: Design numbers refer to Copying test, Chapter 4.

TABLE 11-5

Threading index (ratio of continuously drawn lines to total number of lines drawn) for each subject and each 3-D design

		DESIGNS				
GROUP	SUBJECT					
		No. 25	No. 26	No. 22	No. 24	No. 23
Control	1	-	-	-	-	-
	2	1.8	1.29	1.25	1.20	1.20
	3	1.13	1.29	1.25	1.00	1.00
	4	1.29	2.25	1.25	1.20	1.00
	5	3.00	4.5	1.00	2.00	1.50
	6	1.43	-	1.25	2.00	1.00
	7	-	5.00	-	3.00	6.00
	8	1.50	1.13	2.50	1.00	-
	9	1.00	1.13	1.00	2.00	2.00
	10	1.50	1.29	1.00	2.00	2.00
	11	1.50	1.50	1.25	1.50	2.00
	12	1.29	1.13	1.00	1.00	1.00
	13	1.00	1.29	1.00	1.20	-
	14	3.00	2.25	-	-	2.00
GCD	A	1.29	1.29	1.00	1.00	1.50
	B	1.13	1.29	1.25	1.20	1.50
	C	1.80	1.50	5.00	2.00	6.00
	D	1.50	1.80	1.00	1.00	1.50
	E	1.29	-	1.00	1.50	1.00
	F	1.80	4.50	1.25	1.50	1.50
	G	4.50	4.50	5.00	3.00	6.00
	H	1.50	1.13	5.00	1.20	-
	I	1.13	1.00	1.67	1.20	1.00
	J	1.50	1.29	1.00	-	2.00
	K	1.13	-	1.25	1.20	1.20
	L	-	1.13	1.67	1.20	1.20
	M	1.80	3.00	1.67	1.50	1.20
GCD	D	-	-	1.67	3.00	1.50
	E	2.00	1.75	1.25	1.20	1.00
	G	1.17	1.50	1.67	2.00	1.00
	J	2.00	1.17	1.67	1.00	6.00
	K	-	-	-	2.00	3.00
	L	1.00	2.00	-	6.00	1.00
	M	1.29	1.75	1.67	2.00	1.20
	O	1.67	1.50	2.50	1.50	2.00
	P	6.00	3.00	1.67	2.00	3.00
	R	2.00	-	5.00	1.20	3.00
	S	1.13	1.00	1.00	1.20	1.00
	T	1.00	1.00	1.67	1.00	1.00
	X	2.25	2.25	5.00	2.00	3.00
	ZZ	3.50	3.50	5.00	3.00	2.00

Note: Design numbers refer to Copying test, Chapter 4.

TABLE 11-6

Summary table of analysis of variance
 (one-way) of average Standard threading
 indices^Ø for the 3D designs

Source	SS	df	MS	F
Between groups	8.373	2	4.187	2.321
Within groups	66.727	37	1.803	
Total	75.101			

^ØThe threading indices were each converted to standard scores (with reference to the control group) for each design separately. The resulting standard scores were then averaged across designs for each subject, restandardized, and the analysis of variance applied to these restandardized scores.

APPENDIX 12: TRACING TEST DATA

TABLE 12-1

Number of items* for which subject adopted a
"figure-by-figure" approach

Control Group		GCD	Group		GCD	Group	
Subject No.		Subject	No.	Subject		No.	
1	-	$\bar{A}$	4	D		6	
2	6	$\bar{B}$	6	E		1	
3	3	$\bar{C}$	6	G		-	
4	6	$\bar{F}$	6	J		6	
5	6	$\bar{H}$	5	K		6	
6	-	$\bar{I}$	6	L		6	
7	6	$\bar{N}$	4	M		6	
8	6	$\bar{Q}$	6	O		5	
9	6	$\bar{U}$	4	P		-	
10	5	$\bar{V}$	-	R		6	
11	6	$\bar{W}$	6	S		6	
12	6	$\bar{Y}$	6	T		6	
13	6	$\bar{Z}$	4	X		6	
14	4			ZZ		-	

* Maximum possible = 6

Note: Subject G was not tested on this task. The remaining missing data was caused by (computer) file retrieval problems.

APPENDIX J

AN APPENDIX TO CHAPTER 12

APPENDIX J1: TIMING AND FREQUENCY DATA FOR THE MONITORING TEST

TABLE J1-1

Total frequency of monitoring of each design

		DESIGNS							
									
GROUP	SUBJECT	No. 3	No. 1	No. 5	No. 12	No. 13	No. 14	No. 15	No. 25
Control	1	1	1	1	2	1	3	3	5
	2	1	1	1	2	2	3	4	2
	3	1	1	1	2	2	2	2	1
	4	2	2	2	1	1	1	1	2
	5	1	1	1	5	4	4	4	3
	6	1	1	1	3	4	4	4	3
	7	1	1	2	3	2	4	3	2
	8	1	1	1	2	3	4	4	1
	9	1	1	1	4	3	4	5	3
	10	1	1	3	4	4	8	4	4
	11	7	1	2	4	7	6	7	5
	12	1	1	1	4	3	4	4	2
	13	1	2	1	4	3	4	5	2
	14	1	1	1	3	3	3	5	1
GCD	A	1	1	1	1	2	2	3	1
	B	1	1	1	3	2	3	3	1
	C	1	1	1	2	2	4	4	3
	D	1	1	1	4	4	5	4	3
	E	1	1	1	3	3	1	4	1
	F	1	1	3	4	4	5	6	2
	G	1	1	1	2	3	3	3	1
	H	1	1	1	5	5	6	6	3
	I	5	2	1	6	1	6	5	4
	J	1	1	2	6	5	9	6	5
	K	1	1	1	3	1	3	4	1
	L	1	1	1	4	1	7	7	1
	M	1	1	1	3	3	4	4	1
	N	1	1	1	3	3	4	4	1
GCD	D	1	1	1	3	3	4	5	2
	E	2	1	4	3	4	6	1	2
	F	-	-	-	-	-	-	-	-
	G	1	1	1	2	3	2	2	1
	H	1	1	1	1	2	2	3	1
	I	1	1	1	2	3	4	3	1
	J	1	1	1	5	4	2	3	1
	K	1	4	1	1	4	5	4	7
	L	1	1	1	4	6	8	6	8
	M	-	-	-	-	-	-	-	-
	N	1	1	1	6	4	5	5	1
	O	1	1	1	3	1	3	4	4
	P	1	1	2	1	4	1	1	7
	Q	2	2	2	2	5	5	5	4

Note: Subject G was not tested on this task and the data for subject R could not be located.

TABLE J1-2

Summary table for analysis of variance (split-plot,
least-squares) of monitoring frequency for each item
and each group

Source	SS	df	MS	F
Between Ss	213.865	38	0.161	
Groups	0.322	2	5.932	0.027
Ss w/in Gps	213.543	36		
Within Ss	767.250	273		
Items	386.090	7	55.156	39.331**
Groups x Items	27.768	14	1.983	1.414
Items x Ss w/in Gps	353.392	252	1.402	

**
 $p < .01$

TABLE J1-3
Duration (in msec) of monitoring each design

		DESIGNS						
								
GROUP	SUBJECT	No. 3	No. 1	No. 5	No. 12	No. 13	No. 14	No. 15
Control	1	0.84	0.80	1.02	5.51	1.19	3.42	3.52
	2	0.92	0.80	1.27	6.56	3.05	3.98	5.79
	3	0.60	0.93	0.84	1.69	1.13	1.98	1.67
	4	3.87	3.73	5.04	0.67	1.53	0.81	1.09
	5	1.30	1.29	1.73	6.99	4.27	4.94	5.02
	6	0.76	1.11	1.72	2.22	4.14	2.75	7.37
	7	1.00	0.65	1.47	3.43	1.61	3.03	2.38
	8	0.83	0.70	10.73	1.98	2.92	2.99	3.17
	9	0.88	2.15	1.45	6.28	3.88	6.06	6.98
	10	2.20	2.29	14.75	12.86	9.46	24.96	17.10
	11	1.45	1.59	3.19	16.99	8.10	10.02	18.05
	12	1.01	0.97	1.22	10.91	4.92	9.69	9.38
	13	0.78	0.90	5.36	0.96	2.79	4.37	5.34
	14	0.76	1.96	0.97	4.39	4.28	8.28	5.16
GCD	A	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	C	1.02	1.22	1.35	3.28	2.24	5.32	4.91
	F	1.89	3.57	3.44	6.00	7.95	8.49	10.22
	H	0.56	0.87	0.82	2.98	2.24	0.93	3.93
	I	1.35	1.27	3.81	4.44	4.16	7.18	5.66
	N	1.51	0.55	0.68	0.97	1.14	12.72	2.68
	Q	1.09	1.42	1.77	6.29	1.43	7.54	12.27
	U	14.90	3.85	5.76	13.90	1.94	25.98	15.78
	V	2.70	4.47	6.06	22.82	22.95	29.55	30.01
	W	0.84	9.13	0.94	2.18	1.28	2.92	3.32
	Y	3.20	10.39	1.29	38.70	31.05	34.49	59.55
	Z	1.90	1.04	2.44	6.16	10.15	8.79	12.53
GCD	D	0.72	0.88	1.58	5.50	2.58	7.24	12.50
	E	-	-	-	-	-	-	-
	G	-	-	-	-	-	-	-
	J	0.69	0.73	0.83	4.28	3.06	6.17	3.45
	K	0.83	0.69	0.70	0.96	1.85	2.09	2.74
	L	1.18	1.01	6.81	5.81	3.65	6.82	5.36
	M	2.70	1.29	6.98	16.76	9.05	8.88	11.31
	O	3.67	10.25	5.00	2.98	9.02	11.00	9.73
	P	0.72	1.87	1.06	2.64	3.72	8.03	4.03
	R	-	-	-	-	-	-	-
	S	1.00	1.11	1.38	5.64	4.20	7.29	9.35
	T	1.07	1.59	1.24	8.86	2.37	6.84	9.18
	ZZ	2.01	1.66	3.18	1.60	6.76	3.45	4.16
		3.48	5.94	6.91	16.02	14.00	27.32	21.08
								18.40

Note: In addition to subjects G and R for whom data was unavailable (see note Table J1-1), timing data for subjects A, B and E were lost due to equipment malfunction.

TABLE J1-4

Summary table for analysis of variance (split-plot,
least squares) of monitoring duration for each item
and each group

Source	SS	df	MS	F
Between Ss	6611.191	35		
Groups	568.766	2	284.383	1.553
Ss w/in Gps	6042.425	33	183.104	
Within Ss	8565.885	252		
Items	2209.805	7	315.686	12.496**
Groups x Items	520.299	14	37.164	1.471
Items x Ss w/in Gps	5835.780	231	25.263	

**
 $p < .01$

APPENDIX J2: TIMING INDICES FOR COPYING SINGLE- DOUBLE- AND
"COMPLEX" MULTIPLE-LINE DESIGNS

TABLE J2-1

Mean standard scores for total time to draw
single-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-	D	0.02
2	-0.09	$\bar{B}$	-	E	0.07
3	-0.26	$\bar{C}$	-0.40	G	7.12
4	-0.18	$\bar{F}$	1.58	J	-0.35
5	0.84	$\bar{H}$	0.75	K	-0.64
6	-0.45	$\bar{I}$	-0.27	L	0.55
7	-0.71	$\bar{N}$	-0.94	M	0.30
8	-1.41	$\bar{Q}$	-0.31	O	1.67
9	0.03	$\bar{U}$	1.24	P	0.06
10	2.83	$\bar{V}$	2.98	R	1.23
11	0.38	$\bar{W}$	-0.37	S	0.44
12	-0.47	$\bar{Y}$	2.24	T	-0.24
13	0.44	$\bar{Z}$	-0.05	X	0.92
14	-0.96			ZZ	2.03

TABLE J2-2

Summary table for analysis of variance of mean total-time
standard scores for single-line designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.124	2	0.062	1.943
Within groups	1.117	35	0.032	
Total	1.241			

Note: A logarithmic transformation was applied to the mean
standard scores prior to analysis.

TABLE J2-3
Mean standard scores for maximum velocity
in drawing single-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-0.32	D	-0.69
2	0.86	$\bar{B}$	2.19	E	-0.12
3	-0.58	$\bar{C}$	0.92	G	-1.14
4	0.33	$\bar{F}$	1.13	J	0.94
5	-0.76	$\bar{H}$	0.53	K	1.56
6	0.92	$\bar{I}$	-0.65	L	0.08
7	-	$\bar{N}$	0.97	M	-0.93
8	-0.10	$\bar{Q}$	-0.36	O	-1.28
9	0.59	$\bar{U}$	-0.03	P	0.34
10	-1.7	$\bar{V}$	-1.13	R	4.92
11	-0.73	$\bar{W}$	0.45	S	-0.18
12	2.23	$\bar{Y}$	-1.87	T	1.49
13	-0.41	$\bar{Z}$	-0.26	X	-2.28
14	-0.65			ZZ	0.15

TABLE J2-4

Summary table for analysis of variance of mean maximum
velocity standard scores for single-line designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between Groups	0.002	2	0.001	0.028
Within Groups	1.098	36	0.030	
Total	1.100			

Note: A logarithmic transformation was applied to the mean standard scores prior to analysis.

TABLE J2-5
 Mean standard scores for initial pause before
 executing single-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-	D	0.06
2	0.31	$\bar{B}$	-	E	0.99
3	-0.04	$\bar{C}$	-0.27	G	5.89
4	-0.20	$\bar{F}$	2.11	J	0.66
5	1.37	$\bar{H}$	0.57	K	-1.63
6	-0.50	$\bar{I}$	-0.61	L	4.60
7	-0.44	$\bar{N}$	-0.53	M	1.23
8	-2.31	$\bar{Q}$	0.06	O	1.30
9	0.14	$\bar{U}$	1.99	P	-0.60
10	1.87	$\bar{V}$	2.34	R	3.85
11	0.05	$\bar{W}$	-0.46	S	0.87
12	0.01	$\bar{Y}$	3.80	T	0.03
13	0.80	$\bar{Z}$	-0.28	X	1.48
14	-1.04			ZZ	3.96

TABLE J2-6

Summary table for analysis of variance of mean
initial pause-standard scores for single-line
designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.174	2	0.087	2.754
Within groups	1.103	35	0.032	
Total	1.276			

Note: A logarithmic transformation was applied to the mean
standard scores prior to the analysis.

TABLE J2-7
Mean standard scores for total time to draw
two-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-	D	-0.07
2	-0.25	$\bar{B}$	-	E	-0.05
3	-0.17	$\bar{C}$	-0.57	G	2.20
4	-0.33	$\bar{F}$	1.38	J	0.56
5	1.38	$\bar{H}$	-0.01	K	-1.32
6	-0.74	$\bar{I}$	0.33	L	1.53
7	-1.05	$\bar{N}$	-1.44	M	0.32
8	-0.26	$\bar{Q}$	-0.07	O	2.29
9	0.06	$\bar{U}$	1.20	P	0.26
10	2.64	$\bar{V}$	3.64	R	0.89
11	0.33	$\bar{W}$	-0.24	S	-0.06
12	-0.84	$\bar{Y}$	8.17	T	-0.82
13	-1.17	$\bar{Z}$	-0.04	X	1.14
14	-0.12			ZZ	0.80

TABLE J2-8

Summary table for analysis of variance of
mean total time standard scores for two-line
designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.090	2	0.045	1.09
Within groups	1.439	35	0.041	
Total	1.529			

Note: A logarithmic transformation was applied to the
mean standard scores prior to analysis.

TABLE J2-9
 Mean standard scores for maximum velocity
 in drawing two-line designs

Control Group		GCD	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-1.47	D	0.09
2	0.91	$\bar{B}$	0.31	E	1.44
3	-0.81	$\bar{C}$	1.76	G	-2.02
4	-0.26	$\bar{F}$	-1.76	J	1.24
5	-1.32	$\bar{H}$	1.23	K	3.09
6	0.92	$\bar{I}$	-1.91	L	-0.76
7	0.97	$\bar{N}$	1.34	M	-0.96
8	-0.19	$\bar{Q}$	-0.86	O	-1.82
9	-0.06	$\bar{U}$	-1.66	P	0.29
10	-2.07	$\bar{V}$	-2.77	R	3.90
11	-0.80	$\bar{W}$	0.28	S	-1.33
12	1.39	$\bar{Y}$	-2.47	T	1.05
13	0.38	$\bar{Z}$	-0.52	X	-0.94
14	0.95			ZZ	-0.54

TABLE J2-10

Summary table for analysis of variance of mean
maximum-velocity standard scores for two-line
designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.081	2	0.041	1.124
Within groups	1.340	37	0.036	
Total	1.421			

Note: A logarithmic transformation was applied to the mean standard scores prior to analysis.

TABLE J2-11

Mean standard scores for initial pause before
executing two-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-	D	1.58
2	0.48	$\bar{B}$	-	E	0.47
3	-0.26	$\bar{C}$	1.12	G	-8.56
4	0.21	$\bar{F}$	4.76	J	0.45
5	1.66	$\bar{H}$	1.39	K	-1.67
6	-1.58	$\bar{I}$	2.55	L	9.84
7	-0.37	$\bar{N}$	3.08	M	1.85
8	-0.76	$\bar{Q}$	-0.88	O	6.58
9	1.31	$\bar{U}$	3.45	P	1.74
10	1.09	$\bar{V}$	6.65	R	6.27
11	0.43	$\bar{W}$	0.56	S	1.66
12	-0.25	$\bar{Y}$	5.54	T	-0.84
13	-0.07	$\bar{Z}$	0.72	X	4.77
14	-1.88			ZZ	3.60

TABLE J2-12

Summary table for analysis of variance of mean
initial-pause standard scores for two-line
designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.065	2	0.033	0.860
Within groups	1.329	35	0.038	
Total	1.395			

Note: A logarithmic transformation was applied to the mean standard scores prior to analysis.

TABLE J2-13

Mean standard scores for maximum pause during
execution of two-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	2.40	5	0.38
2	2.73	$\bar{B}$	-0.53	6	0.41
3	0.14	$\bar{C}$	-0.57	8	-0.53
4	-0.41	$\bar{F}$	0.91	12	0.09
5	-0.51	$\bar{H}$	-0.03	13	0.99
6	-0.74	$\bar{I}$	-0.49	14	0.55
7	-0.99	$\bar{N}$	-0.91	15	-0.11
8	-0.17	$\bar{Q}$	-0.31	17	0.33
9	-0.30	$\bar{U}$	0.08	18	-0.49
10	1.44	$\bar{V}$	1.40	20	-0.42
11	0.44	$\bar{W}$	-0.19	22	-0.61
12	-0.55	$\bar{Y}$	2.61	24	-0.96
13	-0.16	$\bar{Z}$	-0.11	29	0.06
14	-0.92			32	-0.29

TABLE J2-14

Summary table for analysis of variance of mean
maximum-pause standard scores for two-line
designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.035	2	0.018	0.601
Within groups	1.083	37	0.029	
Total	1.118			

Note: A logarithmic transformation was applied to the mean standard scores prior to analysis.

TABLE J2-15
Mean standard scores for total time to draw
"complex" multiple-line designs

Control Group		GCD	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-	D	0.13
2	0.22	$\bar{B}$	-	E	0.02
3	-.34	$\bar{C}$	-0.90	G	0.54
4	-.29	$\bar{F}$	1.76	J	0.46
5	-0.09	$\bar{H}$	0.25	K	-1.23
6	-0.44	$\bar{I}$	.39	L	0.59
7	-1.09	$\bar{N}$	-1.13	M	0.61
8	-0.15	$\bar{Q}$	0.11	O	1.87
9	-0.18	$\bar{U}$	1.76	P	0.05
10	3.04	$\bar{V}$	3.09	R	0.14
11	0.92	$\bar{W}$	-0.62	S	0.01
12	-0.24	$\bar{Y}$	2.98	T	-0.90
13	-0.31	$\bar{Z}$	-.35	X	1.09
14	-1.04			ZZ	0.41

TABLE J2-16

Summary table for analysis of variance of mean total-time
standard scores for "complex" multiple-line designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.052	2	0.026	0.781
Within groups	1.176	35	0.034	
Total	1.228			

Note: A logarithmic transformation was applied to the
mean standard scores prior to analysis.

TABLE J2-17

Mean standard scores for maximum velocity in drawing"complex" multiple-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-0.07	D	-0.46
2	0.04	$\bar{B}$	1.13	E	0.85
3	-0.36	$\bar{C}$	1.91	G	-0.84
4	-0.68	$\bar{F}$	-1.67	J	1.35
5	-0.89	$\bar{H}$	0.67	K	2.72
6	1.03	$\bar{I}$	-1.29	L	-0.48
7	1.20	$\bar{N}$	0.77	M	-0.81
8	-0.06	$\bar{Q}$	-1.01	O	-0.95
9	-0.22	$\bar{U}$	-1.55	P	-0.24
10	-1.79	$\bar{V}$	-2.47	R	1.79
11	-1.28	$\bar{W}$	0.55	S	-0.82
12	0.72	$\bar{Y}$	-1.74	T	0.22
13	0.43	$\bar{Z}$	0.08	X	1.26
14	1.88			ZZ	-0.15

TABLE J2-18

Summary table for analysis of variance of mean
maximum velocity standard scores for "complex"
multiple-line designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.051	2	0.026	0.928
Within groups	1.020	37	0.028	
Total	1.071			

Note: A logarithmic transformation was applied to the
mean standard scores prior to analysis.

TABLE J2-19

Mean standard scores for initial-pause
 before executing "complex" multiple-line
 figures

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	-	D	1.03
2	1.18	$\bar{B}$	-	E	0.12
3	-1.08	$\bar{C}$	0.13	G	4.01
4	0.18	$\bar{F}$	4.03	J	1.55
5	0.05	$\bar{H}$	1.30	K	-2.15
6	-1.21	$\bar{I}$	2.11	L	5.89
7	1.08	$\bar{N}$	-1.79	M	1.85
8	-0.40	$\bar{Q}$	0.18	O	6.91
9	0.65	$\bar{U}$	3.01	P	0.14
10	1.97	$\bar{V}$	3.71	R	4.57
11	-0.14	$\bar{W}$	-0.86	S	1.61
12	0.03	$\bar{Y}$	2.98	T	-1.50
13	-0.58	$\bar{Z}$	0.10	X	3.27
14	-1.72			ZZ	2.39

TABLE J2-20

Summary table for analysis of variance of
mean initial-pause standard scores for
"complex" multiple-line designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.233	2	0.116	2.273
Within groups	1.791	35	0.051	
Total	2.023			

Note: A logarithmic transformation was applied to the
mean standard scores prior to analysis.

TABLE J2-21

Mean standard scores for maximum pause during
execution of "complex" multiple-line designs

Control Group		$\overline{\text{GCD}}$	Group	GCD	Group
Subject	z	Subject	z	Subject	z
1	-	$\bar{A}$	1.01	5	0.07
2	0.38	$\bar{B}$	-0.17	6	0.94
3	-0.53	$\bar{C}$	0.79	8	1.03
4	-0.79	$\bar{F}$	2.66	12	2.62
5	-0.29	$\bar{H}$	0.58	13	-0.97
6	-0.18	$\bar{I}$	0.73	14	0.37
7	-0.92	$\bar{N}$	-0.28	15	0.97
8	0.07	$\bar{Q}$	-0.00	17	2.03
9	-0.16	$\bar{U}$	2.29	18	0.41
10	3.03	$\bar{V}$	3.49	20	0.61
11	0.77	$\bar{W}$	-0.47	22	0.02
12	-0.04	$\bar{Y}$	6.21	24	-1.00
13	-0.32	$\bar{Z}$	-0.60	29	2.32
14	-1.03			32	0.88

TABLE J2-22

Summary table for analysis of variance of mean
maximum-pause standard scores for "complex"
multiple-line designs

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	0.093	2	0.046	2.189
Within groups	0.784	37	0.021	
Total	0.877			

Note: A logarithmic transformation was applied to the
mean standard scores prior to analysis.

APPENDIX K

AN APPENDIX TO CHAPTER 13

APPENDIX K1: GENERAL NEUROPSYCHOLOGICAL BATTERY TESTS,
DATA AND ANALYSES

K1-1 Language

TEST.

Neurosensory Centre Comprehensive Examination for Aphasia

(Spreen & Benton, 1968)

Subtest		
No.	Name	Symbol
1	Visual naming	VN
2	Description of use	DU
3	Tactile naming, right	TNR
4	Tactile naming, left	TNL
5	Sentence repetition	SRP
6	Repetition of digits	DRF
7	Reversal of digits	DRR
8	Word fluency	WF
9	Sentence construction	SC
10	Identification by name	IN
11	Identification by sentence (token test)	IS
12	Oral reading (names)	RNO
13	Oral reading (sentences)	RSO
14	Reading names for meaning	RNP
15	Reading sentences for meaning	RSP
16	Visual-graphic naming	VGN
17	Writing of names	WN
18	Writing to dictation	WD
19	Writing (copying)	WC
20	Articulation	ART

KI-1 Language Cont'd

DATA

		NCCEA Subtest																			
Group	Subject	1 VN	2 DU	3 TNR	4 TNL	5 SRP	8 WF	9 SC	10 IN	11 IS	12 RNO	13 RSO	14 RNP	15 RSP	16 VGN	17 WN	18 WD	19 WC	20 ART		
GCD	Ã	16	13	14	16	14	30	19	16	162	20	16	10	17	8	23	13	11	100		
	B	14	16	15	16	15	33	24	16	162	20	16	10	17	8	24	6.5	11	100		
	C	16	16	16	16	17	42	25	16	162	20	16	10	17	8	24	13	11	92		
	F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	I	16	16	16	/	19	38	25	16	162	20	16	10	17	8	24	13	11	100		
	N	16	16	16	16	18	38	25	16	163	20	16	10	17	8	24	11	11	100		
	Q	16	16	16	16	16	36	23	16	163	20	16	10	17	8	24	13	11	100		
	U	15	16	15	16	20	28	25	16	162	20	16	10	17	8	24	13	11	100		
	V	2	1	0	2	3	4	0	12	50	5	0	10	0	0	0	1	12	68		
	W	16	16	16	16	17	23	24	16	153	20	16	10	17	-	-	-	-	100		
	Y	16	16	16	16	12	25	19	16	131	10	16	10	-	-	-	-	-	93		
	Z	1	2	1	0	11	20	12	13	115	20	16	10	17	0	21	13	11	100		
GCD	D	16	16	16	16	18	41	20	16	153	20	16	10	17	8	24	13	11	100		
	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	13	10.5	101		
	G	16	16	16	13	18	20	23	16	154	20	16	10	17	8	23	12	11	98		
	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	K	16	16	16	16	20	36	24	16	160	20	16	10	17	8	24	13	11	100		
	L	14	14	14	14	18	20	13	16	147	18	13	10	6	8	24	12	12	102		
	M	12	16	12	10	14	10	7	16	136	17	13	8	14	0	0	1	9	102		
	O	14	16	16	14	14	21	19	16	160	20	16	10	17	8	24	14	12	103		
	P	15	16	15	/	18	21	23	16	155	20	16	10	17	8	23	13	10.5	106		
	R	15	16	14	/	12	27	17	16	149	20	14	10	16	8	20	10	12	102		
	S	16	16	16	15		28	16	16	157	20	16	10	17	8	23	13	10.5	101		
	T	6	3	/	11	13	6	0	16	121	20	13	10	15	8	21	7	10	97		
	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	ZZ	16	16	16	14	21	32	25	16	162	20	16	10	17	7	24	14	11	100		

Note: See Memory results (digit span) for Repetition of Digits (Subtest 6) and Reversal of Digits (Subtest 7).

OMISSIONS: Subjects F, H, and J excluded due to limited command of the English language.

Subjects E, W, Y tested but some data lost.

Subjects T, P, R could not be tested on the tactile naming, left hand subtest and subject T could not be tested on the tactile naming, right hand subtest due to marked sensory loss/paresis.

Subject X. No General Neuropsychological results are available for this subject. In fact, the General Neuropsychological Battery had been administered pre-operatively. However, the subject had become distressed and testing was discontinued. Following his operation, the patient agreed to participate in the program again providing that the tests already given were not repeated. Thus, only the experimental tests were administered to this patient. Naturally, data from the original pre-operatively administered General Neuropsychological tests could not be incorporated in the present analyses.

K1-1 Language Cont'd

GROUP SUMMARY

NCCEA Subtest

Group	1	2	3	4	5	8	9	10	11	12	13	14	15	16	17	18	19	20
	VN	DU	TNR	TNL	SRP	WF	SC	IN	IS	RNO	RSO	RNP	RSP	VGN	WN	WD	WC	ART
<u>GCD</u>	13.1	13.1	12.8	13.0	14.7	28.8	20.1	15.4	144.1	17.7	14.5	10	15.3	6.2	20.9	10.7	11.1	96
GCD	14.2	14.6	15.1	13.7	16.6	23.8	17	16	150.4	19.5	15	9.8	15.5	7.2	20.6	11.3	10.9	101
<u>GCD</u>	18	27	18	20	27	9	18	18	27	18	9	0	10	22	22	22	0	27
GCD	18	18	10	33	10	18	27	0	36	18	27	9	18	9	33	25	0	0

* on Spreen and Benton's (1968) Profile Form A (normal adults)

K1-1 Language Cont'd

ANALYSES

Technique: Fisher Exact Probability Tests

	0 Percentile Rank	> 0 Percentile Rank
<u>GCD</u>		
GCD		

Results

No significant differences between groups for any subtest ($p > .05$ in each case).

K1-2 Memory

TESTS

Wechsler Memory Scale (Wechsler, 1945).

Subtests

-
- I Personal and Current Information
 - II Orientation
 - III Mental Control
 - IV Logical Memory
 - V Digit Span
 - VI Visual Reproduction
 - VII Associate Learning
-

Face Recognition

- I Recognition
- II Matching (Control)

K1-2 Memory Cont'd

DATA

		Wechsler Memory Scale							Face Recog.	
		I	II	III	IV	V	VI	VII	Recog.*	Match**
Control	1	5	5	2	8.5	9	8	9.5	20	12
	2	5	5	9	9	15	12	15.5	23	12
	3	5	5	9	13.5	13	13	9.5	20	12
	4	6	5	7	10	12	14	16.5	20	12
	5	6	5	9	7	11	13	18	22	12
	6	6	5	7	7.5	11	4	15	20	12
	7	5	5	6	8	10	11	17	23	12
	8	4	5	6	10	10	10	12	23	12
	9	4	5	4	5	8	9	9	22	12
	10	4	5	9	8	11	8	14.5	17	12
	11	5	5	9	5	11	3	9	22	12
	12	6	5	7	15.5	15	12	21	24	12
	13	5	5	9	10	13	13	10.5	23	12
	14	6	5	7	9.5	12	10	17.5	22	12
<u>GCD</u>	A	4	5	6	2	11	9	12	21	12
	B	6	5	8	4.5	13	10	7	23	12
	C	6	5	7	6	11	4	8	21	12
	F	-	-	-	-	-	-	-	19	12
	H	-	-	-	-	-	-	-	23	12
	I	5	5	6	4	11	10	7.5	19	5
	N	5	5	6	7	12	14	16.5	21	12
	Q	4	5	7	8	13	13	12	22	12
	U	5	5	4	13.5	12	4	14.5	20	12
	V	-	-	-	-	-	-	-	19	12
	W	5	5	7	7	9	11	9	24	12
	Y	5	5	2	5	6	7	11	23	12
	Z	-	-	-	-	-	-	-	18	9
GCD	D	5	5	7	5	9	10	9.5	23	12
	E	5	5	9	9	9	0	11	11	10
	G	5	5	5	4	-	0	11	16	2
	J	-	-	-	-	-	-	-	18	12
	K	6	5	7	7.25	9	13	12	21	12
	L	5	5	2	2.5	7	0	3.5	13	9
	M	-	-	-	-	-	-	-	13	3
	O	5	5	5	7	8	5	9	22	12
	P	5	5	7	3	12	2	9	21	8
	R	6	5	6	8	10	2	12.5	19	6
	S	5	5	6	6	9	10	11	23	11
	T	-	-	-	-	-	-	-	12	11
	X	-	-	-	-	-	-	-	-	-
	ZZ	5	5	9	8.5	17	8	18	22	12

* maximum possible = 24

** maximum possible = 12

K1-2 Memory Cont'd

OMISSIONS:

	Subjects	Reason
(i) WMS	F̄, H̄, J, X	English
	V̄, Z̄, M, T	Aphasia
(ii) Face Recog.	X	See K1-1 Omissions

GROUP MEANS

	Wechsler Memory Scale							Face Recog.	
	I	II	III	IV	V	VI	VII	Recog.	Match (Control)
Control	5.1	5	7.1	9.0	11.5	10.0	13.89	21.5	12.0
<u>GCD</u>	5	5	5.9	6.3	10.9	9.1	10.83	21.0	11.2
GCD	5.2	5	6.3	6.0	9.9	5.0	10.65	18.0	9.2

ANALYSES

Wechsler Memory Scale

I. Personal and Current Information

Technique:

Median tests

Results:

No significant differences between GCD and GCD, GCD and Control or Control and GCD groups ($p > .05$ in each case)

II. Orientation

Results:

All subjects achieved a perfect score. Thus, no significant differences between groups.

K1-2 Memory Cont'd

III. Mental Control

Technique:

Analysis of Variance (one-way)

Results:

The Groups did not differ in performance on the Mental Control subtest (see table below)

Source	SS	df	MS	F	p
Between groups	9.48	2	4.74	1.14	.33
Within groups	124.70	30	4.16		

IV. Logical Memory

Technique:

Analysis of Variance (one-way)

Results:

There was a significant Group effect (see table below). However, Duncan tests showed that this effect was due to a difference between the Brain-damaged groups and the Control group ($\overline{\text{GCD}}$ vs Control: $q_p = 3.18$, $p < .05$; GCD vs Control: $q_p = 3.65$, $p < .05$). There was not a significant difference between the GCD and $\overline{\text{GCD}}$ groups ($q_p = 0.33$, $p > .05$).

Source	SS	df	MS	F	p
Between groups	66.598	2	33.299	4.183	0.025
Within groups	238.788	30	7.960		

K1-2 Memory Cont'd

V. Digit Span

Technique:

Analysis of Variance (one-way)

Results:

There was not a significant Group effect for digit span (see table below).

Source	SS	df	MS	F	p
Between groups	14.954	2	7.477	1.374	.27
Within groups	163.289	30	5.443		

VI. Visual Reproduction

Technique:

Analysis of Variance (one-way)

Results:

The GCD group was significantly worse on this test than either the Control group ($q_p = 4.35$, $p < .01$) or the $\overline{\text{GCD}}$ group ($q_p = 3.22$, $p < .05$).

There was no significant difference between the $\overline{\text{GCD}}$ and Control groups on the test ($q_p = 0.75$, $p > .05$).

Source	SS	df	MS	F	p
Between groups	155.172	2	77.586	5.028	.013
Within groups	462.889	30	15.430		

K1-2 Memory Cont'd

VII. Associate Learning

Technique:

Analysis of Variance (one-way)

Results:

There was no significant Group effect for digit span (see table below).

Source	SS	df	MS	F	p
Between groups	80.446	2	40.223	2.975	.07
Within groups	405.614	30	13.520		

Face Recognition

I. Recognition

Technique:

Analysis of Variance (one-way)

Results:

There was a significant Group effect (see below. Duncan tests showed that the GCD groups performed more poorly than the $\overline{\text{GCD}}$ groups ($q_r = 3.63$, $p < .05$) and Control group ($q_r = 4.31$, $p < .01$) while the $\overline{\text{GCD}}$ and Control groups did not differ significantly ($q_r = 0.62$, $p > .05$).

Source	SS	df	MS	F	p
Between groups	94.900	2	47.450	5.328	0.009
Within groups	329.500	37	8.905		

K1-2 Memory Cont'd

II. Matching (Control)

Technique:

Fisher Exact Probability

Results:

The proportion of subjects performing worse than the worst Control subject on the Face matching test was significantly greater for the GCD than the GCD group ($p < .05$).

K1-3 Spatial

TESTS

Miscellaneous spatial tests

- (i) Obscured figures (after Luria, 1973);
- (ii) Embedded figures (Luria's Neuropsychological Investigation; Christensen, 1974);
- (iii) Cube analysis (Luria's Neuropsychological Investigation; Christensen, 1974);
- (iv) Reading time (Luria's Neuropsychological Investigation; Christensen, 1974);
- (v) Compass directions (Luria's Neuropsychological Investigation; Christensen, 1974).

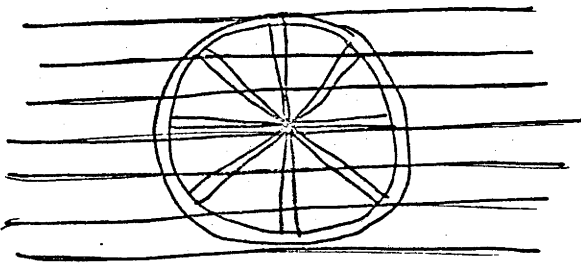
- (i) Obscured figures

Instructions:

"What can you see in this picture?"

Items:

1.

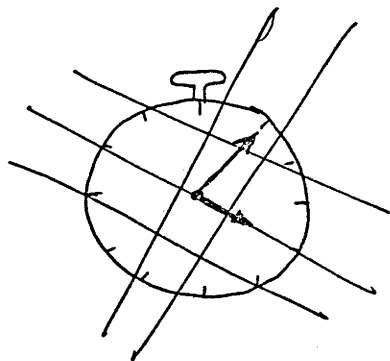


Answer for No.1 was "wheel" but other reasonable answers accepted (eg. "orange").

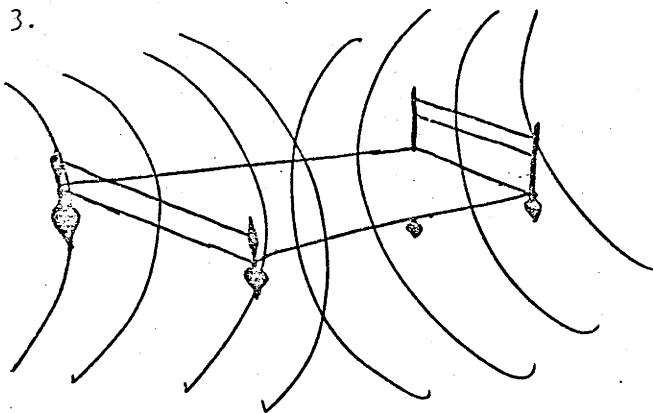
If an item was failed, the unobscured version of the picture was presented.

K1-3 Spatial Cont'd

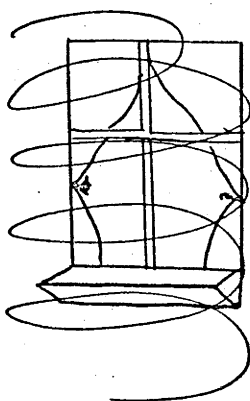
2.



3.



4.

*Scoring:*

2 points per item (4X2=8).

K1-3 Spatial Cont'd

(ii) Embedded Figures

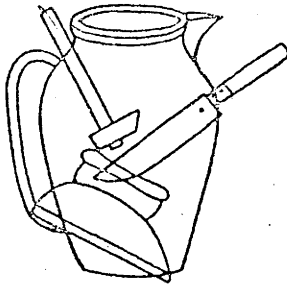
Instructions:

Items 1 and 2. "What objects can you see in this jumble of objects?"

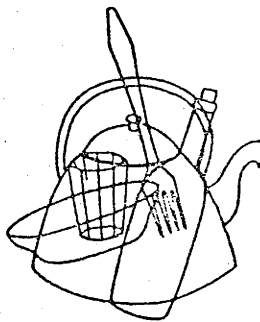
Item 3. "Which of these objects (E points to the six separate objects located in the lower field) can you see here (E points to embedded figure)?"

Items:

1.

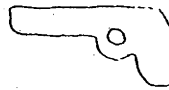
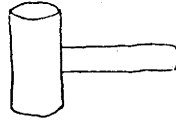
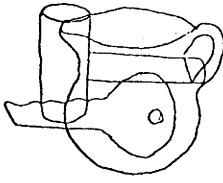


2.



K1-3 Spatial Cont'd

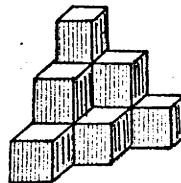
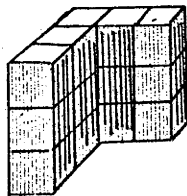
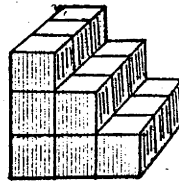
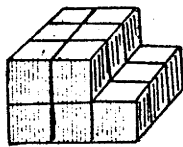
3.



(iii) Cube analysis

Instructions:

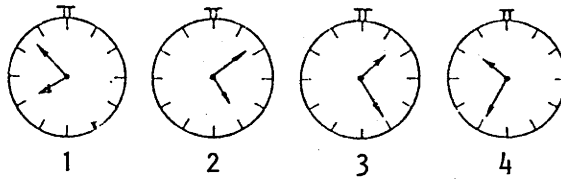
"How many blocks must there be in this block construction? Include the ones you can't see that would be needed to make sure the construction was solid."

Items:*Scoring:*

2 points per item (4X2=8).

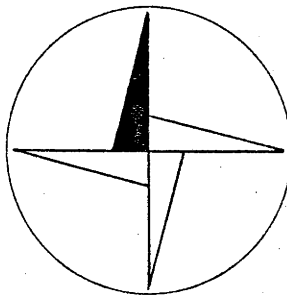
K1-3 Spatial Cont'd

(iv) Reading time

*Instructions:**"What time is it on the clock?"**Items:**Scoring:*

2 points per item (1 point for hour hand and 1 point for minute hand) ($4 \times 2 = 8$).

(v) Compass

*Instructions:**"Which direction is this pointer on the compass?"**Item:**Scoring:*

1 point per direction ($4 \times 1 = 4$)

K1-3 Spatial Cont'dLeft-Right Orientation (Goodglass & Kaplan, 1972)

Items, administration and scoring as described by Goodglass and Kaplan, 1972, p. 51. (Maximum score = 12 points).

Colour Naming*Instructions:*

1. Naming. "What colour is this?"
11. Matching. "Pair these into identical colours."

Items:

Twelve colours were employed. These were Blue, red, yellow, green, orange, purple, pink, brown, aqua, black.

Scoring:

1. Naming, 1/2 point per item ($10 \times 1/2 = 5$).
11. Matching. 1/2 point per item ($10 \times 1/2 = 5$).

K1-3 Spatial Cont'd

DATA

Group	Subject	Combined miscellaneous spatial Score	Left-right orientation	Colour	
				Naming	Matching
Control	1	33	4	4	5
	2	40	12	5	5
	3	35.5	12	5	5
	4	36	11	4.5	5
	5	38	12	4.5	5
	6	28	11	3.5	5
	7	38	11	4	5
	8	34	12	3	5
	9	38	12	5	5
	10	35.5	12	3.5	5
	11	37.5	12	4.5	5
	12	37.5	12	5	5
	13	39	12	3.5	5
	14	32.5	11	4.5	5
<u>GCD</u>	A	36.5	12	5	5
	B	40.0	12	4	5
	C	35.0	12	4	5
	F	26.5	11	-	5
	H	35.0	10	-	5
	I	36.0	12	5	5
	N	40	12	5	5
	Q	34	12	5	5
	U	34	11	3.5	3
	V	-	(4)	(0)	5
	W	38	12	5	5
	Y	36	12	4.5	5
	Z	-	(10)	(2.5)	5
GCD	D	33.5	4	5	5
	E	27.0	12	2.5	5
	G	26.0	12	3	5
	J	30.0	12	-	5
	K	38	12	5	5
	L	24	10	3.5	5
	M	23	(11)	(3)	5
	O	33.5	7	2.5	4
	P	24.0	10	4.5	5
	R	18.5	7	3.5	3
	S	33.5	12	5	5
	T	-	(10)	(0)	5
	X	-	-	-	-
	ZZ	30.5	12	3.5	5

KI-3 Spatial Cont'd

OMISSIONS

Test	Subjects	Reason
Combined Misc. Spatial	$\bar{V}$, $\bar{Z}$, T	Aphasia
	X	See KI-1
Left-Right Orient.*	X	See KI-1
Colour - Naming*	$\bar{F}$, $\bar{H}$, J	English
	X	See KI-1
Matching	X	See KI-1

*Analyses were conducted twice for the Left-Right Orientation and Colour-naming tests. In the first analysis, aphasics were included; in the second they were excluded.

GROUP MEANS

	Combined misc. spatial	L-R orientation	Colour Naming	Matching
Control	35.9	11.1	4.3	5.00
<u>GCD</u>	35.5	10.9 ^Ø /11.6*	4.0 ^Ø /4.6*	4.9
GCD	28.5	10.1 ^Ø /10.0*	3.4 ^Ø /3.8*	4.8

Ø including aphasics

*excluding aphasics

Combined Miscellaneous Spatial

Technique:

Analysis of Variance (one-way) and Duncan Multiple Range tests.

Results:

The GCD group performed significantly more poorly than the $\overline{\text{GCD}}$ group: ($q_p = 5.57, p < .01$) and the Control group ($q_p = 6.24, p < .01$). The $\overline{\text{GCD}}$ and Control groups did not differ on the test ($q_p = 0.33, p > .05$).

Source	SS	df	MS	F	p
Between groups	430.66	2	215.33	11.88	.0001
Within groups	616.05	34	18.12		

Left-right orientation

Technique:

Median tests.

Results:

The proportion of subjects performing worse than their combined median was not significantly different for the GCD and $\overline{\text{GCD}}$ groups (*Fisher* $p > .05$). This was the case, both when the aphasic subjects from each group were included in the analysis, and also when these subjects were excluded. Similar comparisons were conducted between the GCD and Control groups and the $\overline{\text{GCD}}$ and Control groups. None of these comparisons showed significant differences in group medians either when aphasics were included or excluded (*Fisher* $p > .05$ in each case.)

Colour

Naming

Technique:

Median tests.

K1-3 Spatial Cont'd

Results:

The proportion of subjects performing worse than their combined median was not significantly different for any group pair. This was the case, both when aphasic subjects were included in analyses and also when they were excluded (*Fisher* $p > .05$ in each case).

Matching

Technique:

Fisher Exact Probability tests (perfect vs imperfect score).

Results:

Only three subjects made errors on the colour matching test. Two of these subjects were from the GCD group and the third from the $\overline{\text{GCD}}$ group. There was not a significant difference between the GCD and $\overline{\text{GCD}}$, GCD and Control or $\overline{\text{GCD}}$ and Control groups in the number of imperfect scores ($p > .05$ in each case).

K1-4 Body Schema

TESTS

Body Part Identification (Goodglass & Kaplan, 1972).

See Goodglass and Kaplan, 1972, p. (9) for details of the content, administration and scoring of this test. (Maximum score = 20).

In-between test (Kinsbourne & Warrington, 1962).

Instructions:

"I am touching two of your fingers. How many of your fingers, are in-between the two that I am touching?"

Items:

There were 8 Control pretest items in which the subject was required to perform the task with his eyes open. The main test was then administered.

K1-4 Body Schema Cont'd

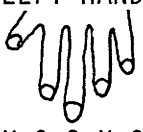
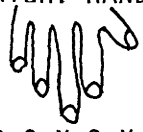
This test consisted of 20 trials, 10 for each hand. Half of the trials were on the left hand and half on the right hand. Kinsbourne and Warrington (1962) do not provide details of trials employed in their study. However, since there are 10 possible ways of touching two fingers of one hand, each was employed once for each hand for the main test. The same random order of ten trials was used for each subject (left and right hand orders being reverse of each other). The crosses (X) below indicate the fingers which were touched on each trial.

1. Control Pretest, Eyes Open

	LEFT HAND		RIGHT HAND
			
1.	0 X 0 0 X	5.	0 X 0 X 0
2.	0 X 0 X 0	6.	0 0 0 X X
3.	X 0 0 0 X	7.	0 X 0 0 X
4.	X X 0 0 0	8.	X 0 0 0 X

K1-4 Body Schema Cont'd

II. Test, Eyes Closed

LEFT HAND	RIGHT HAND
	
1. X 0 0 X 0	11. 0 0 X 0 X
2. 0 X 0 X 0	12. X X 0 0 0
3. 0 0 X X 0	13. 0 0 0 X X
4. 0 0 X 0 X	14. X 0 0 X 0
5. 0 X X 0 0	15. X 0 0 0 X
6. X 0 0 0 X	16. 0 0 X X 0
7. 0 X 0 0 X	17. 0 0 X 0 X
8. X X 0 0 0	18. 0 X X 0 0
9. 0 0 0 X X	19. 0 X 0 X 0
10. X 0 X 0 0	20. 0 X 0 0 X

Scoring:

I Eyes Open. 1 point for each correct trial ($4 \times 1 + 4 \times 1 = 8$).

II Eyes Closed. 1 point for each correct trial on hand ipsilateral to subject's lesion (see Text, Chapter 13, for explanation). ($10 \times 1 = 10$).

In the case of the Control group, 1 point was allocated for each correct trial for each hand and an average score per hand calculated.

K1-4 Body Schema Cont'd

DATA

Group	Subject	Body part Identification	In-Between test	
			Eyes open	Eyes closed
Control	1	19	8	8
	2	19	8	10
	3	20	8	10
	4	19	8	9
	5	20	8	9.5
	6	20	8	9
	7	20	8	9.5
	8	19	8	8.5
	9	20	8	10
	10	19	8	8
	11	20	8	8.5
	12	20	8	10
	13	20	8	9
	14	20	8	10
<u>GCD</u>	A	19.5	8	10
	B	20	8	10
	C	20	8	10
	D	-	8	8
	E	-	8	10
	F	20	8	9
	G	19.5	8	8
	H	20	8	6
	I	(11)	-	-
	J	20	8	10
	K	19	8	10
	L	(18)	8	8
	M	20	8	9
	N	20	8	10
GCD	O	20	8	9
	P	20	7.5	6
	Q	20	7.5	5
	R	-	8	9
	S	20	8	8
	T	20	8	7
	U	(18)	8	5
	V	20	8	6
	W	20	8	5
	X	20	8	9
	Y	(20)	-	-
	Z	-	-	-
	ZZ	20	8	10

K1-4 Body Schema Cont'd

OMISSIONS

Test	Subjects	Reason
Body-Part Identification	$\bar{F}$, $\bar{H}$, J	English
	X	See K1-1
In-Between test	$\bar{V}$, T	Severe expressive aphasia*
	X	See K1-1

*The aphasics who were included obtained perfect scores on the "Eyes Open" condition. It therefore seemed reasonable to include them. It is possible that via a disconnection mechanism, subjects might have language problems specific to the tactile modality. In fact, excluding these subjects would not affect the conclusions.

GROUP MEANS

Group	Body-Part Identification	In-between test	
		Eyes open	Eyes closed
Control	19.6	8	9.2
$\overline{\text{GCD}}$	18.8 $\emptyset$ /19.8*	8	9.1
GCD	19.8 $\emptyset$ /20.0*	7.9	7.3

$\emptyset$ including aphasics

*excluding aphasics

ANALYSES

Body-Part Identification

Technique:

Fisher Exact Probability (less than perfect score vs perfect score)

K1-4 Body Schema Cont'd*Results:*

A comparison of each pair of groups failed to indicate any significant difference in the number of subjects obtaining less than a perfect score ($p > .05$ in each case).

In-Between test*Technique:*

Fisher Exact Probability (combined median)

Results:

The groups did not show any differences between pairs of groups in the percentage of subjects scoring in or above the combined pair median category ($p > .05$ in each case).

A further analysis of finger agnosia was attempted. A brain-damaged subject was defined as suffering from finger agnosia if he scored worse than the worst Control. Six subjects fell into this category. Five of these were from the GCD group (representing 42% of GCD group) and one from the $\overline{\text{GCD}}$ group (8% of $\overline{\text{GCD}}$ group). However, this apparent difference between the two brain-damaged groups is not significant ($p > .05$).

(Eyes open - Only two subjects, both from the GCD group, made an error on the "Eyes open" test. In each case, the error was made on the first trial of testing and was correctly altered upon further explanation of the task).

K1-5 Praxis

TESTS

Apraxia Test

(Goodglass & Kaplan, 1972)

Items:

The following items from the Goodglass and Kaplan (1972) Apraxia test were employed. Left and right hands were used in alternation for items 6 to 15.

Bucco-facial

- | | | |
|--------------------------|--------------------|----------------------|
| (1) Cough | (2) Sniff | (3) Blow out a match |
| (4) Suck through a straw | (5) Puff out cheek | |

Intransitive Limb

- | | | |
|------------------|----------------------|----------------------------|
| (6) Wave goodbye | (7) Beckon come here | (8) Finger on lip for shh. |
| (9) Salute | (10) Signal stop | |

Transitive Limb

- | | | | |
|-----------------------|------------|-------------|----------------|
| (11) Brush teeth | (12) Shave | (13) Hammer | (14) Saw board |
| (15) Use screw driver | | | |

Serial Actions

- (16) (Provide paper, envelope and stamp). "Put the paper in the envelope, seal it and stamp it."

Scoring:

<u>Bucco-facial.</u> One point per item	(5 x 1 = 5)
<u>Intransitive Limb.</u> One point per item.	(5 x 1 = 5)
<u>Transitive Limb.</u> One point per item	(5 x 1 = 5)

and 1 point for each item in which Contact not made between hand and face/table.

(5 x 1 = 5)

Serial Actions.

(1 x 2 = 2)

Total = 22

K1-5 Praxis Cont'dTest of Motor Organization*Items:*

The following three items were selected from Luria's Neuropsychological Investigation (Christensen, 1974). (See also Strub & Black, 1977).

1. Draw this pattern without lifting your pen from the paper...
(keep the pattern going).



2. Repeatedly hit the top of the desk, first with your fist, then with your open palm and then with the side of your hand. Keep going until I ask you to stop. (Demonstrate. Ask patient to say "fist, palm, edge" before commencing task).
3. Experimenter places hands on desk, one in a fist and one with fingers extended palm down. E then rapidly alternates the position of his two hands simultaneously (extending fingers of one hand while making a fist with the other).

Scoring:

1. Each item scored as "Pass" or "Fail". A Fail was allocated 1 error point and the number of error points for the three items calculated ($3 \times 1 = 3$).

K1-5 Praxis Cont'd

DATA

Group	Subject	Apraxia Test	Motor Organization	
			I. All items	II. First 2 items
Control	1	20	0	0
	2	22	0	0
	3	21	0	0
	4	21	0	0
	5	22	0	0
	6	21	0	0
	7	21.5	0	0
	8	21	0	0
	9	22	1	1
	10	20	0	0
	11	22	0	0
	12	22	0	0
	13	22	0	0
	14	21	0	0
<u>GCD</u>	A	21.5	0	0
	B	22	0	0
	C	20	0	0
	F	21	1	1
	H	21	0	0
	I	21	(0) ^P	0
	N	22	0	0
	Q	22	0	0
	U	21	(0) ^P	0
	V	(9.5)	0	0
	W	21	0	0
	Y	21.5	1	1
	Z	(17)	2	2
GCD	D	21	0	0
	E	18.5	(3) ^P	2
	G	20	1	0
	J	19	0	0
	K	21.5	0	0
	L	18	2	1
	M	(12.5)	2	1
	O	21	2	1
	P	20	1	1
	R	21	(0) ^P	0
	S	22	0	0
	T	(16)	(3) ^P	2
	X	-	-	-
	ZZ	22	0	0

(^P) Due to a paralysis of one hand, item 3 could not be administered. The score for these subjects was estimated as three times the average score for the first two items.

K1-5 Praxis Cont'd

OMISSIONS

	Subject	Reason
Apraxia test*	X	See K1-1
Motor organization	X	See K1-1

*Analyses were conducted twice for this test. In the first the aphasics of each group were included, while in the second they were excluded.

GROUP MEANS

Group	Apraxia test	Motor organization	
		I	II
Control	21.3	0.07	0.07
<u>GCD</u>	20.0 ^Ø /21.3*	0.31	0.31
GCD	19.4 ^Ø /21.3*	1.08	0.62

Ø including aphasics

* excluding aphasics

K1-5 Praxis Cont'd

ANALYSES

Apraxia Test*Technique:*

Fisher Exact Probability (Median test)

Results:

The groups did not differ in their medians ($p > .05$ in each case).

This was true both when the aphasics were included in the analysis and also when they were excluded.

(A second analysis compared the proportion of "apraxics" in the two brain-damaged groups. An apraxic was defined as a subject who scored worse than the worst Control. There were seven apraxics (four of whom were aphasic). Five of these apraxics were drawn from the GCD group and two from the $\overline{\text{GCD}}$ group. (Excluding aphasics these figures were 3 GCD and 0 $\overline{\text{GCD}}$ subjects). Fisher tests showed that there was no significant difference between the proportion of apraxics in the GCD and $\overline{\text{GCD}}$ groups either when aphasics were included, or when they were excluded).

Motor Organization*Technique:*

Fisher Exact Probability (perfect vs imperfect score).

Results:

The GCD group achieved significantly fewer perfect scores than did the Control group ($p < .05$). However the GCD and $\overline{\text{GCD}}$ groups did not differ significantly in the proportion of perfect scores on the task ($p > .05$) and $\overline{\text{GCD}}$ and Control groups did not differ significantly ($p > .05$).

It might be considered that the above analysis is unsatisfactory. Not all subjects were able to attempt the third test item due to a paralysis

K1-5 Praxis Cont'd

of one hand. Therefore, the scores of these patients were estimates based only on the first two items (see Data, footnote ()^P). One alternative would be to exclude the third item for all subjects. In fact, when this is done, none of the comparisons between groups attains significance (*Fisher* $p > .05$ in each case) although the difference in proportion of subjects in the GCD and Control groups with perfect scores approaches significance ($p < .10$).

In conclusion, neither analysis shows convincing evidence of differences between the GCD and GCD groups.

K1-6 Arithmetic

TEST

Arithmetic test*Items:*

The following "paper and pencil" items were administered. Ample working space was provided below the problem for calculations. A number of the problems were taken from Luria's Neuropsychological Investigation (Christensen, 1974).

- | | | |
|------------------------------|------------------------|--|
| (1) $3 + 4$ | (2) $6 + 7$ | (3) 3×3 |
| (4) 7×8 | (5) $7 - 4$ | (6) $8 - 5$ |
| (7) $16 \div 4$ | (8) $12 \div 3$ | (9) $27 + 8$ |
| (10) $44 + 57$ | (11) $31 - 7$ | (12) $41 - 14$ |
| (13) $12 + 9 - 6$ | (14) $32 - 4 + 9$ | (15) 26×7 |
| (16) 49×5 | (17) $186 \div 6$ | (18) $176 \div 8$ |
| (19) $2/3 \times 24$ | (20) $4/3 \times 15$ | (21) $(5 \times 8) - \frac{1}{2} (5 \times 8)$ |
| (22) $2X + X = 15$
Find X | (23) $(16 + 8) \div 8$ | |

Scoring:

Each correct answer was allocated one point ($23 \times 1 = 23$).

K1-6 Arithmetic Cont'd

DATA

Control		GROUP <u>GCD</u>		GCD	
Subject	Arith. score	Subject	Arith. score	Subject	Arith. score
1	13	$\bar{A}$	18	D	2
2	22	$\bar{B}$	22	E	10
3	22	$\bar{C}$	17	G	4
4	20	$\bar{F}$	16	J	4
5	23	$\bar{H}$	20	K	20
6	13	$\bar{I}$	17	L	4
7	17	$\bar{N}$	23	M	3
8	18	$\bar{Q}$	23	O	8
9	15	$\bar{U}$	17	P	10
10	22	$\bar{V}$	0	R	3
11	19	$\bar{W}$	5	S	11
12	23	$\bar{Y}$	23	T	9
13	17	$\bar{Z}$	19	X	-
14	19			ZZ	18

OMISSIONS

Subject	Reason
X	See K1-1

K1-6 Arithmetic Cont'd

GROUP MEANS

Group	Arithmetic
Control	18.79
$\overline{\text{GCD}}$	16.92
GCD	8.15

ANALYSES

Technique:

Kruskall-Wallis one-way analysis of variance followed by Mann-Whitney tests (corrected for ties). (A non parametric test was chosen as the variances were heterogeneous; $F_{max} = 4.02, p < .05$).

Results:

There was a significant effect across groups ($\chi^2 = 14.534, p < .001$). Individual Mann-Whitney tests showed that the GCD group scored significantly more poorly than the $\overline{\text{GCD}}$ group ($Z_U = -2.75, p < .01$) and the Control group ($Z_U = -3.75, p < .0005$). There was no significant difference in performance between the Control and $\overline{\text{GCD}}$ groups ($Z_U = -.27, p > .05$).

K1-7 Logical-Grammatical Structures

TEST

Logical-Grammatical Structures test

Items:

The following items from Luria's Neuropsychological Investigation (Christensen, 1974) were employed.

1. Will you please point at the pencil and the key?
(Supplied objects: pencil, key, comb)
2. Will you please point at the key and comb?
(Supplied objects: pencil, key, comb)
3. Now I want you to point with the key toward the pencil.
(Supplied objects: pencil, key, comb)
4. And will you please point to the pencil with the key?
(Supplied objects: pencil, key, comb)
5. Look at this picture. Show me by pointing who is the daughter's mother. (Supplied picture: woman and girl)
6. Will you tell me whether the "father's brother" and the "brother's father" are two persons or one and the same.
7. Which boy is shorter if John is taller than Peter?
8. Do these statements mean the same: "John is taller than Peter" and "Peter is taller than John?"
9. Which statement is correct: "A fly is bigger than an elephant" or "an elephant is bigger than a fly?"
10. Look at these two cards (one card black, one card grey). Which of the two is lighter?
11. Which of the two is less light? (see 10)
12. Which of the two is darker? (see 10)
13. Which of the two is less dark? (see 10)
14. Listen carefully and tell me which girl is fairest if Olga is fairer than Kate but darker than Sonia.
15. If I say "Peter struck John", which of the boys was the victim?
16. Which statement is correct: "The sun illuminates the earth" or "the earth is illuminated by the sun?"

K1-7 Logical-Grammatical Structures Cont'd

17. Listen carefully and tell me what did I do first, if I had breakfast after I sawed wood.
18. Listen carefully and tell me whether this statement "I am unaccustomed to disobeying rules" is said by a disciplined or an undisciplined person.

Scoring:

Items 1 and 2: 1/2 point each (2 x 1/2 = 1)

Items 3 to 18: 1 point each (16 x 1 = 16)

Total = 17

K1-7 Logical-Grammatical Structures Cont'd

DATA

GROUP					
Control		<u>GCD</u>		GCD	
Subject	LGS Score	Subject	LGS Score	Subject	LGS Score
1	15	$\bar{A}$	13	D	14
2	16	$\bar{B}$	16	E	14
3	16	$\bar{C}$	13	G	12
4	17	$\bar{F}$	-	J	-
5	15	$\bar{H}$	-	K	15
6	16	$\bar{I}$	17	L	11.5
7	14	$\bar{N}$	14	M	8
8	15	$\bar{Q}$	17	O	12
9	14	$\bar{U}$	16	P	10
10	16	$\bar{V}$	-	R	12
11	16	$\bar{W}$	13	S	22
12	17	$\bar{Y}$	11	T	-
13	16	$\bar{Z}$	-	X	-
14	14			ZZ	16

OMISSIONS

Subjects	Reason
$\bar{F}$, $\bar{H}$, J	English
$\bar{V}$, $\bar{Z}$, T	Marked* expres- sive aphasia
X	See K1-1

*These subjects suffered such severe expressive aphasia that they would not have been able to offer the required brief one or two word replies.

K1-7 Logical-Grammatical Structures Cont'd

GROUP MEANS

Group	Logical-Grammatical Structures
Control	15.5
$\overline{\text{GCD}}$	14.4
GCD	13.3

ANALYSES

Technique:

Kruskall-Wallis one-way analysis of variance followed by Mann-Whitney tests (corrected for ties).

Results:

There was a significant difference in ranks across groups ($\chi^2 = 6.59$, $p < .05$). The GCD group did not differ significantly from the $\overline{\text{GCD}}$ group ($U = 33$, $Z_U = -1.26$, $p > .05$). However, the performance of the GCD group was significantly poorer than that of the Control group ($U = 30.5$, $Z_U = -2.59$, $p < .01$) while that latter group did not differ significantly from the $\overline{\text{GCD}}$ group ($U = 45.5$, $Z_U = -1.13$, $p > .05$).

K1-8 Cognitive Ability

TESTS

- (a) Premorbid Cognitive ability

Information subtest (WAIS; Wechsler, 1955)

- (b) Current Cognitive ability

Verbal tests

- (i) Proverb Interpretation

Items:

The five items employed were taken from the WAIS Comprehension subtest (Wechsler, 1955) and from Strub and Black (1977, p. 110).

1. What does this saying mean? Strike while the iron is hot.
2. Shallow brooks are noisy?
3. One swallow doesn't make a summer?
4. A drowning man will clutch at a straw?
5. A golden hammer breaks an iron door?

Scoring:

2 points per item ($5 \times 2 = 10$).

- (ii) Similarities

Items:

The five items employed were chosen from the WAIS Similarities subtest.

1. What is similar about an orange and a banana?
2. A coat and a dress?
3. North and west?
4. A table and chair?
5. A poem and statue?

Scoring:

2 points per item (as for WAIS) ($5 \times 2 = 10$).

K1-8 Cognitive Ability Cont'd

(iii) Conceptual series completion (Strub & Black, 1977, p. 115).

Instructions:

I am going to show you some numbers, letters or words in series. Each series will be incomplete and needs an additional word, letter or number to complete it. Each dash calls for either a number or a letter to be filled in. Take each item in order, but if you don't understand it, don't spend too much time on any one item.

Items:

1. 2 7 12 17 --
2. AZ BY CX D-
3. tote to snow on spun up stab --
4. elephant 87654321 plan 5732 lap ---

Scoring:

2 points per item ($4 \times 2 = 8$)

(iv) Analogies (Luria's Neuropsychological Investigation; Christensen, 1974).

Items:

Can you find the word that has the same relationship to

1. good as high to low (high is low as good is to ?)
2. wide as fat to thin (fat is to thin as wide is to ?)
3. finger as foot to shoe (etc.)
4. bicycle as table to leg (etc.)

If fail, give choice of four.

5. library as regiment to books (etc.)
6. street as river to banks (etc.)

Scoring:

1 point per item ($7 \times 1 = 7$)

KI-8 Cognitive Ability Cont'd

- (v) Categorical Intelligence (Luria's Neuropsychological Investigation; Christensen, 1974).

Items:

1. On this card you see the names of 4 objects among which one does not belong to the same group as the other three. Which one is it?

SPADE - SAW - AXE - LOG

2. SPOON - TABLE - GLASS - PLATE

3. BALL - DOLL - ROCKING HORSE - KNIFE

4. CIGAR - WINE - CIGARETTE - TOBACCO

(All names are read aloud to subject)

Scoring:

2 points per item ($4 \times 2 = 8$)

- (vi) Arithmetical problems (Luria's Neuropsychological Investigation; Christensen, 1974).

Items:

1. Peter had 2 apples and John had 6 apples. How many did they have altogether?
2. Jane had 7 apples and gave three away. How many did she have left?
3. Mary had 4 apples and Betty had two more than Mary. How many apples did they have both together?
4. A farmer had 10 acres of land; from each acre he harvested 6 tons of grain. He sold $\frac{1}{3}$ to the Government. How much did he have left?
5. There were 18 books on two shelves; there were twice as many on one shelf as on the other. How many books were there on each shelf?
6. A pedestrian walked to the station in 15 minutes and a cyclist rides there 5 times faster. How long does the cyclist take to get to the station?
7. A pencil is 6 inches long, the shadow of this pencil is 18 inches longer than the pencil. How many times longer than the pencil is the shadow?

K1-8 Cognitive Ability Cont'd*Scoring:*

Items 1 to 3. One point per item ($3 \times 1 = 3$)

Items 4 to 7. Two points per item ($4 \times 2 = 8$)

Total = 11

Non-verbal test

Weigl Form Sorting task

Scoring:

The sorting attempts were classified as "PASS" (if subject correctly sorted by both colour and shape categories), "1-CATEGORY" (if subject correctly sorted by one but not both categories) and "0-CATEGORY" (if subject unable to sort by either category).

K1-8 Cognitive Ability Cont'd

DATA

	Information	Verbal tests		Weigl
	(Group Score)	All tests	Arithmetic problems (vi) excluded	
1	12	29	27	PASS
2	21	49	39	PASS
3	20	50	39	PASS
4	20	40	32	PASS
5	13	38	29	PASS
6	17	26	18	1-CATEGORY
7	14	34	25	PASS
8	11	36	27	PASS
9	10	22	15	1-CATEGORY
10	18	44	33	PASS
11	16	31	23	1-CATEGORY
12	26	52	41	PASS
13	23	40	32	PASS
14	13	25	21	PASS
A	13	27	20	PASS
B	22	42	34	PASS
C	17	37	27	PASS
F	-	-	-	PASS
H	-	-	-	PASS
I	13	34	29	PASS
N	19	37	28	PASS
Q	15	41	34	PASS
U	11	30	23	PASS
V	-	-	-	1-CATEGORY
W	20	31	25	PASS
Y	24	36	26	PASS
Z	-	-	-	PASS
D	14	29	20	1-CATEGORY
E	19.5	27	20	1-CATEGORY
G	14	16	11	PASS
J	-	-	-	1-CATEGORY
K	28	42	33	PASS
L	9	11	6	0-CATEGORY
M	-	-	-	0-CATEGORY
O	10	19	12	0-CATEGORY
P	12	13	11	PASS
R	12	12	10	1-CATEGORY
S	7	27	7	PASS
T	-	-	-	PASS
X	-	-	-	-
ZZ	20	43	34	PASS

K1-8 Cognitive Ability Cont'd

OMISSIONS

Test	Subjects	Reason
Information and Verbal tests	$\bar{F}$, $\bar{H}$, J $\bar{V}$, $\bar{Z}$, M, T X	English Aphasia See K1-1
Weigl	X	See K1-1

GROUP SUMMARY

Mean Information and Verbal test scores

Group	Information	Verbal	
		All	Arithmetic problems excluded
Control	16.71	36.86	28.64
$\overline{\text{GCD}}$	17.11	35.00	27.33
GCD	15.05	23.90	16.4

Weigl performance: frequency of subjects in each category

Group	PASS	1-CATEGORY	0-CATEGORY
Control	11	3	0
$\overline{\text{GCD}}$	6	4	3
GCD	12	1	0

K1-8 Cognitive Ability Cont'd

ANALYSES

Information subtest*Technique:*

One-way analysis of variance

Results:

There was no significant Group effect (see table below).

Source	SS	df	MS	F	p
Between groups	23.938	2	11.969	.44	.65
Within groups	815.971	30	27.199		

Verbal Tests*Technique:*

Kruskal-Wallis one-way analysis of variance followed by Mann-Whitney tests (A non-parametric test was used due to heterogeneity of variance across groups). The Mann-Whitney tests incorporated a correction for ties.

Results:

There was a significant Group effect ($\chi^2 = 6.763$, $p < .05$). Mann-Whitney tests showed that the GCD group was inferior to the $\overline{\text{GCD}}$ group ($z_U = -2.09$, $p < .05$) and to the Control group ($z_U = -2.37$, $p < .02$). The $\overline{\text{GCD}}$ and Control groups did not differ significantly ($z_U = -.35$, $p > .05$).

The preceding analyses were based on the combined verbal cognitive test score for each subject. This score incorporated performance on the Arithmetical Problems subtest (vi). Since it has already been shown

KI-8 Cognitive Ability Cont'd

that arithmetical ability for the GCD group was inferior to that of the other groups it is theoretically possible that the difference in cognitive ability was due solely to the arithmetic subtest. In fact, the difference in Verbal-cognitive ability between the Groups is still quite clear even after removal of scores on the arithmetical subtest (see data and group means above).

Non-Verbal test (Weigl)

Technique:

Fisher Exact Probability tests. (PASS vs 1-,2- CATEGORY RESPONSES)

Results:

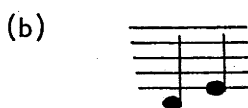
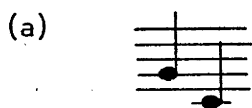
The proportion of subjects offering a PASS rather than a 1- or 2- CATEGORY RESPONSE was compared for each group. On this basis it was found that the GCD group performed more poorly than the $\overline{\text{GCD}}$ group ($p < .05$). No other comparisons attained significance ($p > .05$ in each case).

KI-9 Perception and Reproduction of Pitch (after Luria's Neuropsychological Investigation; Christensen, 1974).

TASK

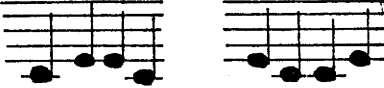
Items:

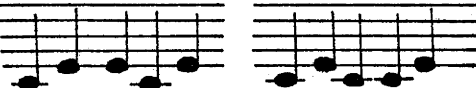
1. I'm going to play you two tones. I want you to tell me if the two tones are the same or different. If they are different which one is higher, the first or the second.



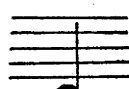
K1-9 Perception and Reproduction of Pitch Cont'd

2. Now I'm going to play you a group of sounds and then I'll play you another group of sounds. I want you to tell me whether the two groups of sounds are the same or different.

(a)  (b) 

(c)  (d) 

3. Please listen to this tone and sing it

(a)  (b)  (c)  (d) 

Scoring:

Item 1:	2 points per subitem	$(3 \times 2 = 6)$
Item 2:	2 points per subitem	$(4 \times 2 = 8)$
Item 3:	1 point subitem a, 2 points for subitems b to d.	$(1 \times 1 + 3 \times 2 = 7)$

Total = 21

KI-9 Perception and Reproduction of Pitch Cont'd

DATA

Control		GROUP GCD		GCD	
Subject	Pitch score	Subject	Pitch score	Subject	Pitch score
1	14	$\bar{A}$	21	D	10
2	18	$\bar{B}$	20	E	8
3	16.5	$\bar{C}$	15	G	10
4	14	$\bar{F}$	5	J	10.5
5	16	$\bar{H}$	17	K	17
6	16	$\bar{I}$	17	L	8
7	15	$\bar{N}$	-	M	-
8	13	$\bar{Q}$	13.5	O	6
9	15	$\bar{U}$	13	P	14
10	17.5	$\bar{V}$	-	R	8.5
11	15	$\bar{W}$	21	S	10.0
12	-	$\bar{Y}$	10	T	-
13	13.5	$\bar{Z}$	-	X	-
14	18			ZZ	15

OMISSIONS

Subjects	Reason
$\bar{N}$, M	Equipment malfunction
$\bar{V}$, $\bar{Z}$, T	Aphasia
X	See KI-1
12	Missing data

K1-9 Perception and Reproduction of Pitch Cont'd

GROUP MEANS

Control	15.50
<u>GCD</u>	15.25
GCD	<u>10.64</u>

ANALYSES

Technique:

Kruskall-Wallis one-way analysis of variance followed by Mann-Whitney tests (corrected for ties).

Results:

There was a significant group effect ($\chi^2 = 9.437, p < .01$).

Mann-Whitney tests showed a significant difference between the GCD and GCD groups ($Z_U = -3.08, p < .005$) and between the GCD and Control groups ($Z_U = -2.12, p < .05$). There was no difference between the Control and GCD groups ($Z_U = -0.09, p > .05$).

K1-10 Perception and Reproduction of Rhythm (from Luria's Neuro-psychological Investigation; Christensen, 1974).

TASK

Items:

1. How many taps do you hear?

(a) " (b) "" (c) 'UU (d) " " ' (e) UUU"

K1-10 Perception and Reproduction of Rhythm Cont'd

2. I'm going to tap out a rhythm. Then I'll tap out a second rhythm.

Tell me if the second rhythm is the same as the first.

(a) 'U 'U 'U 'U "U "U "U

(b) "U "U

(c) 'U''' 'U''' UU''' U'''

3. Please tap the same rhythm as I do.

(a) " " " " (b) ''' ''' '' '''

(c) "UUU "UUU "UUU' (d) '''U '''U

Scoring:

1 point per subitem (5 x 1 + 3 x 1 + 4 x 1 = 12).

K1-10 Perception and Reproduction of Rhythm Cont'd

DATA

Control		$\overline{\text{GCD}}$		GCD	
Subject	Rhythm score*	Subject	Rhythm score	Subject	Rhythm score
1	11.0 (8.0)	$\bar{A}$	12.0 (8.0)	D	11.5 (8.0)
2	11.5 (8.0)	$\bar{B}$	12.0 (8.0)	E	9.5 (7.0)
3	10.5 (6.5)	$\bar{C}$	12.0 (8.0)	G	5.5 (5.0)
4	10.5 (7.0)	$\bar{F}$	11.5 (8.0)	J	6.5 (5.0)
5	12.0 (8.0)	$\bar{H}$	10.0 (7.0)	K	9.0 (6.0)
6	9.5 (6.0)	$\bar{I}$	11.5 (8.0)	L	7.0 (5.0)
7	11.0 (8.0)	$\bar{N}$	12.0 (8.0)	M	5.0 (5.0)
8	12.0 (8.0)	$\bar{Q}$	11.5 (8.0)	O	7.0 (7.0)
9	11.5 (8.0)	$\bar{U}$	5.0 (4.0)	P	9.5 (6.0)
10	11.5 (8.0)	$\bar{V}$	- -	R	6.0 (5.0)
11	9.5 (6.0)	$\bar{W}$	11.5 (8.0)	S	11.0 (7.5)
12	11.0 (7.0)	$\bar{Y}$	9.0 (7.0)	T	- -
13	10.5 (7.0)	$\bar{Z}$	- -	X	- -
14	11.5 (8.0)			ZZ	11.0 (8.0)

*Numbers in brackets refer to the score for the "perception" component of the test (i.e. Items 1 and 2).

OMISSIONS

Subjects	Reason
$\bar{V}$, $\bar{Z}$, T	Aphasia
X	See K1-1

K1-10 Perception and Reproduction of Rhythm Cont'd

GROUP MEANS

Control	10.96 (7.39)*
$\overline{\text{GCD}}$	10.73 (7.45)
GCD	8.21 (6.20)

*Numbers in brackets refer to the mean score for the perception component of the test.

ANALYSES

Technique:

Kruskall-Wallis one-way analysis of variance followed by Mann-Whitney tests (corrected for ties).

Results:

There was a significant Group effect ($\chi^2 = 11.78$, $p < .005$). The GCD group was inferior to the $\overline{\text{GCD}}$ group ($U = 22$, $Z_U = -2.73$, $p < .01$) and to the Control group ($U = 25$, $Z_U = -3.06$, $p < .005$). The $\overline{\text{GCD}}$ and Control groups did not differ ($U = 60$, $Z_U = -0.95$, $p > .30$).

Analysis of the "perceptual" scores of the Rhythm Test showed a significant Group effect ($\chi^2 = 8.944$, $p < .02$). There was a significant difference between the GCD and $\overline{\text{GCD}}$ groups ($U = 28$, $Z_U = -2.46$, $p < .02$) and between the GCD and Control groups ($U = 37$, $Z_U = -2.51$, $p < .02$).

There was no difference between the $\overline{\text{GCD}}$ and Control groups ($U = 65$, $Z_U = -0.77$, $p > .05$).

K1-11 Miscellaneous Cont'd

TASKS

Reitan Trail-Making Test

Simple Reaction time

Stimulus - single red light.

Foreperiod - variable, 2-4 seconds.

10 practice trials, 50 test trials.

K1-11 Miscellaneous Cont'd

DATA

Group	Subject	Errors		Reitan TM Time		Simple Reaction Time	
		A B		A B		Mean	S.D.
						(msecs)	
	1	0	(20)*	25.7	361.5	173.8	24.2
	2	0	0	34.0	58.0	160.4	44.5
	3	0	0	25.7	56.9	166.9	25.2
	4	0	0	39.0	111.9	189.1	57.5
	5	0	0	32.1	61.2	204.8	35.5
	6	0	0	39.9	110.0	187.2	24.8
	7	0	0	21.8	54.9	255.8	84.6
	8	0	0	38.4	71.7	219.1	50.5
	9	0	0	44.6	121.0	218.4	30.0
	10	0	0	67.5	139.8	272.6	94.3
	11	0	0	50.1	108.1	207.5	221.3
	12	0	0	32.7	54.7	168.6	29.7
	13	0	0	42.4	85.9	175.4	35.0
	14	0	0	31.3	69.3	202.2	50.0
	A	0	1	40.0	228.0	255.2	50.6
	B	0	0	46.0	106.0	156.2	23.8
	C	-	-	-	-	279.0	34.2
	F	0	0	82.8	113.9	288.8	81.3
	H	0	0	77.2	181.5	336.8	98.5
	I	0	0	42.0	80.0	395.2	117.2
	N	0	1	20.9	46.9	146.3	21.4
	Q	0	0	38.5	84.1	210.1	52.3
	U	0	7	55.6	215.3	339.8	50.3
	V	-	-	-	-	225.8	87.8
	W	0	0	43.7	96.5	188.9	73.0
	Y	0	1	62.0	300.0	172.4	39.5
	Z	-	-	-	-	275.6	57.5
	D	0	1	55.0	188.0	237.0	90.0
	E	0	3	167.8	335.0	591.3	246.2
	G	1	3	134.7	206.7	-	-
	J	0	1	96.0	436.1	387.6	173.3
	K	0	1	20.8	63.1	240.6	90.6
	L	0	(20)*	89.2	175.7	219.5	77.6
	M	-	-	-	-	223.8	109.5
	O	0	2	79.8	240.1	223.0	85.5
	P	1	7	143.0	296.0	613.5	250.9
	R	4	6	134.6	407.7	290.5	75.8
	S	0	0	38.9	63.3	193.0	24.1
	T	-	-	-	-	296.2	111.3
	X	-	-	-	-	-	-
	ZZ	0	0	37.1	91.2	285.6	66.3

* Could not do task

K1-11 Miscellaneous Cont'd

OMISSIONS

	Subjects	Reason
Trail making	$\bar{W}$, $\bar{Z}$, M, T	Aphasics not tested
	X	See K1-1
	$\bar{C}$	Experimenter oversight
Reaction time	G	Missing data
	X	See K1-1

GROUP MEANS

	A	Reitan B	TM A	B	Simple Reaction Time Mean	S.D.
Control	0	1.4	37.5	104.6	200.13	57.7
<u>GCD</u>	0	1.0	50.9	145.2	251.5	60.6
GCD	0.5	4.0	90.6	227.5	316.8	116.8

ANALYSES

Reitan Trail Making*Technique:*

Error. Fisher Exact Probability Tests (perfect score vs at least one error).

Time. Kruskal-Wallis one-way analysis of variance followed by Mann-Whitney tests (corrected for ties).

K1-11 Miscellaneous Cont'd*Results:*

Error. Part (a). There were no significant differences between groups in the proportion of subjects making at least one error ($p > .05$ in each case). Part (b). The proportion of GCD subjects making errors was greater than the proportion of Control subjects making errors ($p < .005$) while the $\overline{\text{GCD}}$ and Control groups did not differ in this respect ($p > .05$). However, the GCD and $\overline{\text{GCD}}$ groups did not differ in tendency to make errors ($p > .05$).

Time. Part (a). There was a significant Group effect ($\chi^2 = 9.427$, $p < .01$). The GCD group was significantly slower than the Control group ($z_U = -2.68$, $p < .01$) as was the $\overline{\text{GCD}}$ group ($z_U = -2.05$, $p < .05$). The GCD and $\overline{\text{GCD}}$ groups did not differ significantly ($z_U = -1.62$, $p > .05$). Part (b). There was a significant group effect ($\chi^2 = 7.015$, $p < .05$). The GCD group was significantly slower than the Control group ($z_U = -2.57$, $p < .01$) but there were no differences between the GCD and $\overline{\text{GCD}}$ ($z_U = -1.27$, $p > .05$) or $\overline{\text{GCD}}$ and Control groups ($z_U = -1.35$, $p > .05$).

Simple Reaction time*Technique:*

Kruskall-Wallis one-way analysis of variance followed by Mann-Whitney tests (corrected for ties).

K1-11 Miscellaneous Cont'd*Results:*

Mean Reaction time. There was a significant Group effect ($\chi^2 = 9.76$, $p < .01$). Only the GCD group differed from the Control group, the former being significantly slower on average than the latter ($U = 24$, $Z_U = -3.25$, $p < .005$). The GCD and $\overline{\text{GCD}}$ groups did not differ ($U = 67$, $Z_U = -0.90$, $p > .05$). Nor did the $\overline{\text{GCD}}$ group differ from the Control ($U = 55$, $Z_U = -1.75$, $p > .05$).

Standard deviation of individual reaction times. There was a significant Group effect ($\chi^2 = 9.378$, $p < .01$). The GCD group showed greater individual reaction time variability than the $\overline{\text{GCD}}$ group ($U = 38$, $Z_U = -2.38$, $p < .02$) and the Control group ($U = 35$, $Z_U = -2.72$, $p < .01$) while the $\overline{\text{GCD}}$ and Control groups did not differ ($U = 70$, $Z_U = -1.02$, $p > .05$).

APPENDIX K2: AGE AND EDUCATIONAL STATUS

Individual ages and educational-levels are available in Appendix A.

TABLE K2-1
Analysis of variance of age for the Control,
GCD and $\overline{\text{GCD}}$ groups

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	1105.62	2	552.81	3.26*
Within groups	6438.62	38	169.44	

*
 $p > .05$

TABLE K2-2
Analysis of variance of educational level for
Control, GCD and $\overline{\text{GCD}}$ groups

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups	28.675	2	14.338	3.898*
Within groups	139.764	38	3.678	

*
 $p < .05$

APPENDIX K3: ANALYSES OF COVARIANCE, CONTROLLING FOR EFFECTS OF AGE-
AND EDUCATIONAL LEVEL.

TABLE K3-1

Analysis of covariance table for Complex Copying with
age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	4.252	2	2.126	25.841***
Within groups _{adj}	2.962	36	0.082	
Total _{adj}	7.214	38		

 $p < .001$

TABLE K3-2

Analysis of covariance table for Complex Perceptual
Discrimination error with age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	266.650	2	133.325	6.895**
Within groups _{adj}	696.144	36	19.337	
Total _{adj}	962.794	38		

**
 $p < .01$

TABLE K3-3

Analysis of covariance table for Attribute (perceptual)
error with age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	159.567	2	79.783	17.781****
Within groups _{adj}	161.531	36	4.487	
Total _{adj}	321.098	38		

 $p < .0001$

TABLE K3-4

Analysis of covariance table for Attribute (motor)
error with age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	115.639	2	57.820	8.086***
Within groups _{adj}	257.408	36	7.150	
Total _{adj}	373.047	38		

 $p < .001$

TABLE K3-5

Analysis of covariance table for Relative-Size
Production error with age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	0.044	2	0.022	4.667*
Within groups _{adj}	0.168	36		
Total _{adj}	0.212	38		

* $p < .05$

TABLE K3-6

Analysis of covariance table for Spatial¹ error
 (General Neuropsychological Battery) with age and
 education covariates

Source	SS	df	MS	F
Between groups _{adj}	302.422	2	151.211	8.022***
Within groups _{adj}	603.161	32	18.849	
Total _{adj}	905.583	34		

*** $p < .001$

¹ Combined error for "Miscellaneous spatial tests".

TABLE K3-7

Analysis of covariance table for Complex Discrimination
latency with age and education covariates

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups _{adj}	0.432	2	0.216	5.044*
Within groups _{adj}	1.543	36	0.043	
Total _{adj}	1.975	38		

* $p < .05$

TABLE K3-8

Analysis of covariance table for Cognitive ability (General
 Neuropsychological Battery) with age and education covariates

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups _{adj}	618.356	2	309.178	4.468*
Within groups _{adj}	1937.720	28	69.204	
Total _{adj}	2556.076	30		

* $p < .05$

TABLE K3-9

Analysis of covariance table for Monitoring Frequency
(monitoring task) with age and education covariates

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups _{adj}	8.763	2	4.382	0.085
Within groups _{adj}	1747.406	34	51.394	
Total _{adj}	1756.169	36		

TABLE K3-10

Analysis of covariance table for Monitoring duration
(monitoring task) with age and education covariates

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups _{adj}	50.47	2	25.24	0.361
Within groups _{adj}	816.61	34	24.02	
Total _{adj}	867.08	36		

TABLE K3-11

Analysis of covariance table for Maximum pause (multiple-line figure copying) with age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	307.000	2	153.500	0.619
Within groups _{adj}	8922.295	36	247.842	
Total _{adj}	9229.295	38		

TABLE K3-12

Analysis of covariance table for Initial Pause (multiple-line figure copying) with age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	25.991	2	12.995	3.587*
Within groups _{adj}	119.559	33	3.623	
Total _{adj}	145.550	35		

* $p < .05$

TABLE K3-13

Analysis of covariance table for Maximum velocity
(multiple-line figure copying) with age and education
covariates

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups _{adj}	485.072	2	242.536	0.987
Within groups _{adj}	8845.674	36	245.713	
Total _{adj}	9330.746	38		

TABLE K3-14

Analysis of covariance table for Total time (multiple-line
figure copying) with age and education covariates

Source	SS	<i>df</i>	MS	<i>F</i>
Between groups _{adj}	5.134	2	2.567	2.494
Within groups _{adj}	33.957	33	1.029	
Total _{adj}	39.091	35		

TABLE K3-15

Analysis of covariance table for Verbal Memory (combined
WMS subtests) with age and education covariates

Source	SS	df	MS	F
Between groups _{adj}	452.746	2	226.373	3.370*
Within groups _{adj}	1880.911	28	67.175	
Total _{adj}	2333.657	30		

* $p < .05$

Duncan comparisons among means

The results of the Duncan comparisons between adjusted means are reported in Chapter 13. The error terms employed in these comparisons were computed as recommended by Kirk (1968, p. 475).