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BEHAVIORAL PROBLEMS OF ADHERING TO A DECISION POLICY

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". . . while you are following any set of rules and policies, follow them to the letter. It is the only way they can help you [Edwards & Magee, 1966]."

I. Introduction

- A. Statement of the problem
- B. Overview of this presentation
  1. key facets of nonadherence to policy
     - a. changes in criteria, goals, or aspiration levels
     - b. lack of necessary cognitive skills: random error and systematic bias
  2. techniques to facilitate adherence to policy

II. Changes in Criteria, Goals, or Aspirations

- A. Wall Street folklore and research agree: sudden gains and losses can alter one's goals and, accordingly, one's propensity for taking risks.
  1. McGlothlin (1956) found that losing bettors at the race track developed increased preferences for low probability, high payoff bets in an attempt to recoup their losses. Research in Las Vegas shows that gamblers who win money sometimes become more conservative.
  2. Changes in policy are desirable if they are in response to relatively stable changes in financial position.
- B. Group decisions embody risk-taking criteria different than the criteria of the individuals in the group.

III. Policy Implementation as Skilled Thinking

- A. Contrary to popular belief, an individual's overt judgments and decisions may reflect his "true decision policies" only imperfectly; observed judgments deviate from desired policy due to the presence of random error (inconsistency) and systematic biases. Faithful adherence to policy requires a degree of cognitive skill that may often exceed our intuitive capabilities.

B. Random error

1. "He [the judge] 'has his days': Bordeom, fatigue, illness, situational and interpersonal distractions all plague him, with the result that his repeated judgments of the exact same stimulus configuration are not identical. He is subject to all those human frailties which lower the reliability of his judgments below unity. And, if the judge's reliability is less than unity, there must be error in his judgments--error which can serve no other purpose than to attenuate his accuracy. If we could remove some of this human unreliability by eliminating the random error in his judgments, we should thereby increase the validity of the resulting predictions [Goldberg, 1970]."

2. Studies by Garland (1959) and others have revealed a surprising degree of inconsistency when a physician diagnoses the same case on two or more occasions.

3. A study of expert horse-race handicappers shows that as the amount of available information increases (a) accuracy remains stable, (b) confidence rises sharply, and (c) judgment policies exhibit more random error.

See Figures 1, 2, 3, & 4, and Table 1

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4. Research with the "lens model" illustrates the importance of "cognitive control."

   a. the learning task (multiple-cue probability learning)

   3 3 cues $\left\{\begin{matrix} X_1, X_2, \& X_3 \\ A, B, \& C \end{matrix}\right\}$ with numerical levels between 1 and 10

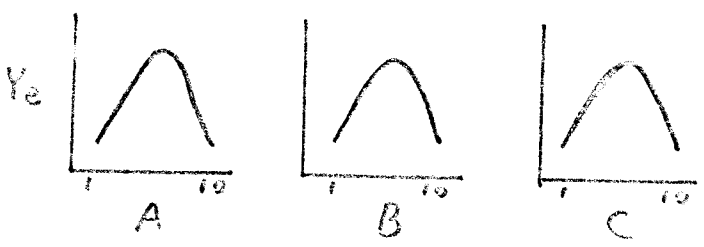
   a criterion (Y_e) that ranges between 1 and 20

   policy weights: A = .4, B = .8, C = .2

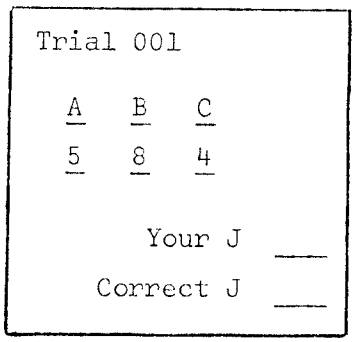
   task equations (policies to be learned):

   linear $Y_e = .4A + .8B + .2C + \text{Error}$

   nonlinear $Y_e = .4(\alpha_1 A^2 + \alpha_2 A + \alpha_3) + .8(\alpha_1 B^2 + \alpha_2 B + \alpha_3) + .2(\alpha_1 C^2 + \alpha_2 C + \alpha_3) + \text{Error}$



Function Forms in Nonlinear Task



basic stimulus display

A, B, C change from trial to trial for 200 trials.

Petife Drake — 110

Lt. ch. f, 3, by Admiral Drake—Petite Soeur, by Beau Pere.
Breeder, G. G. Jamieson. 1960 3 M 0 0 ——
Owner, Mr. & Mrs. G. G. Jamieson. Trainer, L. W. Kidd. $5,000 1959 0 M 0 0 ——

May11-60¹B.M	6 f	1:12⅗ft	56	113	1½	2h	22	54¾	SchihF³	M5000	76	VegasBoy118	Gasperlee118	PioneerJoe 12
Apr27-60¹B.M	6 f	1:13²⅘sy	73	108*	4¾	59	7151017		D'l'gE¹²	M6500	59	L'leSpinet114	Tr'scribe118	T'xasT'b'ine 12
Mar15-60¹B.M	6 f	1:13 ft	48	113	84¾	910111511119			Sch'hF¹²	M5000	59	TheWave114	Nightken113	Web'sReg'rds 12

May 6 BM 3-8 ft :36⅗h — May 2 BM 3-8 ft :35⅕h — April 26 BM 5-8 ft 1:03⅗b

Royal Jane — 115

Ch. f, 3, by Texas Sandman—Fighting Jane, by Silver Horde.
Breeder, O. J. Todd. 1960 4 M 0 0 $125
Owner, Mr. & Mrs. E. H. Sorrell. Trainer, J. Weatherington. $5,000 1959 0 M 0 0 ——

May 4-60⁵B.M	6 f	1:12⅘ft	40	113	43½	52½	55	58¼	Harm'zW⁸	5000	70	Starl'tTow'r108	Q'tWaters112	Wahalis 8
Apr26-60¹B.M	6 f	1:11⅘ft	91	115	52½	73¼	78½	711	PierceD³	Mdn	76	MissJoyce110	Himalaya115	Heione 12
Mar31-60⁵B.M	6 f	1:12 ft	173	113	14	12	1h	43½	PierceD²	4000	79	Q'tWaters112	Facetieux113	BernO'Dine 12
Mar25-60¹B.M	6 f	1:11⅘ft	53	108	104¾	87¼	811	812	ShirotaM⁵	3500	72	HighDrag112	EdwardJ.114	RareToubo 12

April 20 BM 5-8 ft 1:01⅘h — April 10 BM 3-8 ft :36⅕h — March 23 BM 1-2 ft :49h

Bold Dust — 115

B. f, 3, Bold Gallant—Garara, by Nirgal.
Breeder, E. J. Harris. 1960 3 M 0 0 ——
Owner, E. & J. Harris. Trainer, F. Jolosky. $5,000 1959 2 M 0 0 $40

May 4-60²B.M	6 f	1:12⅗ft	251	114	5¾	1014101410¹⁴			HuntG¹	Mdn	66	Minnigerode118	HearYe118	Zipper-Bee 12
Apr28-60¹B.M	6 f	1:14 sl	182	115	21½	45	59	612	HuntG¹⁰	Mdn	61	Sals-R'ge115	Sm'lT'wnGirl115	Kylew'd 12
Apr14-60¹B.M	6 f	1:11⅘ft	99	114	85¼	1010101011¹⁰			HuntG⁷	Mdn	65	GoHost118	Principillo118	FoxyRudy 11
Sep23-59⁵Pom	a 6 f	1:14⅕ft	24	116	86½	89	79	616	Cant'iJ⁴	M5000	66	Dimity116	MissGenelle116	SunC. 8
Sep 3-59¹Dmr	6 f	1:11⅗ft	88	116	10¹²¹¹¹⁹¹¹¹⁶¹¹¹⁸				G'ithsR⁹	M7500	68	Gladiola116	PaulineK.111	SocietyRose 12

May 9 BM 3-8 ft :36⅕h — April 4 BM 5-8 ft 1:05b

Adagio — 115

Ch. f, 3, by Esprit de France—Nautch Girl, by Soodani.
Breeder, Parkhill Larms Ltd. 1960 11 M 0 3 $485
Owner, Mr. & Mrs. N. C. Archer. Trainer, N. C. Archer. $5,000 1959 7 M 1 1 $302

May10-60⁴B.M	6 f	1:12 ft	32	115	87	88¾	55	34¾	HuntG⁶	M5000	76	Facetieux110	FlowerDeck115	Adagio 12
Apr 2-60¹B.M	6 f	1:10⅘ft	122	113	117¾	118¾	1010	1015	GlennP⁹	4500	74	Stencil116	ArmedMiss116	DarkSh'dows 11
Mar17-60¹B.M	1 1/16	1:45⅕ft	50	113	87¾	1017	1024	1027	Gl'nnP¹⁰	M5000	51	Unrestr'ned113	K'rnPr'ss113	Brck'nL've 11
Mar10-60¹B.M	6 f	1:12⅕ft	25	113	115¾	105¾	510	67¼	GlennP⁴	M5000	75	Pr'ssG'ki114	Chic'oMiss108	Unrestr'ned 12
Mar 5-60¹B.M	6 f	1:12 ft	27	107	84¼	57¾	613	69¾	GlennP⁵	3500	73	Reg'lGl'a109	Capt'nBos'n113	Q'tWaters 9
Feb22-60³TuP	5½ f	1:06 ft	81	115	52¾	64	52¾	54¼	Dittf'chH⁴	Mdn	80	TribalSec't120	Fr'tyBomb115	Unwritt'n 12
Feb17-60³TuP	6 f	1:12⅖ft	5¼	113	55	55½	76¼	87	FreyP¹⁰	M3500	76	JakeH'grass120	Ete'iLiz115	Time'sLast 12
Jan20-60³TuP	6 f	1:13 ft	3¼	110*	1113	811	35	23	Mu'yK¹²	M2500	77	PanchoDee120	Quico120	NowOn 12
Jan17-60¹TuP	5½ f	1:08⅗gd	3¾	115	73¼	54	43	44¼	Dittf'chH³	Mdn	68	WingLo115	Transcribe115	BullCamp 10
Jan 8-60¹TuP	6½ f	1:19⅗ft	25	110*	73¼	73¼	3½	3½	MurrayK³	Mdn	76	Jean'sChes't120	Directly120	Transcribe 10

May 6 BM 5-8 ft 1:02⅖hg — April 25 BM 3-4 ft 1:16⅗h — April 21 BM 3-8 ft :36⅗h

Painted Pet — 115

Ch. f, 3, by Mafosta—Gold Paint, by Gold Bridge.
Breeder, F. R. Graham. 1960 2 M 0 0 ——
Owner, Montrose Stable. Trainer, K. R. Darbyshire. $5,000 1959 8 M 0 1 $130

May10-60⁴B.M	6 f	1:12 ft	7¾	115	21	32	43½	610	Art'rnJ⁵	M5000	73	Facetieux110	FlowerDeck115	Adagio 12
Apr21-60¹B.M	6 f	1:13⅗ft	30	113	916	1021	1029	1024	V'zkeM³	M5000	51	D'm'dMark118	Kitsimbanyi113	P'n'rJoe 12
Dec14-59³B.M	6 f	1:13⅘ft	17	116	54	74¼	95¾	85½	YakaR⁷	M5000	68	TurkishNight116	SunnyNote116	SunC. 12
Dec10-59¹B.M	6 f	1:13⅕ft	22	114	83¾	94	11261127		YakaR¹¹	M5000	50	Slippery117	NoExit114	MarketSpecial 12
Jun29-59²L.P	4½ f	:53⅘ft	10	117	7	44	32½	33	Rich'dson⁵	Mdn		MyBoyJ'n113	FoxeeLucee110	TigerTh'y 10
Jun25-59²L.P	4½ f	:54⅕ft	5½	117	8	77¼	87¼	77	Cop'nollK²	Mdn		BraveKni't113	FoxeeLucee110	Y'gRuf'n 10
Jun15-59²L.P	4½ f	:53⅕gd	5½	118	6	44	45	46¼	Cop'nollK⁴	Mdn		Ur-Mia118	AmcanCathy111	Kydette 9
May 8-59³Tan	5 f	1:01⅕ft	15	117	73¼	85¼	89¾	79¼	V'zkeM⁹	M6000	78	BlueTish117	Nina deTejas117	Step gBy 11
May 4-59³Tan	5 f	1:00⅖ft	24	117	64¼	53¼	43	78¾	Art'burnJ⁷	Mdn	82	Svalan117	Lady d'Arg't112	N'a deTejas 7
Apr20-59³Tan	5 f	1:01 ft	8¾	115	1½	2h	43¼	79¼	V'zkeM²	M8000	79	MissJ'hnnieD.115	T'mO'Farrell118	Reins 11

May 9 BM 3-8 ft :35⅗h — May 5 BM 1-2 ft :48⅗hg — April 13 BM 5-8 ft 1:05bg

Continuity — 115

Ch. f, 3, by Balsamo—Sunny Pharlara, by Sun Briar.
Breeder, O. R. Harrod. 1960 5 M 0 1 $375
Owner, Mr. & Mrs. N. Jensen. Trainer, N. Jensen. $5,000 1959 3 M 0 0 $25

May10-60¹B.M	6 f	1:11⅗ft	28	115	74½	56½	37	34¾	Art'rnJ⁶	M5000	80	Pilikia115	TilliesBaby110	Continuity 12
May 4-60⁴B.M	1 1/16	1:45⅗ft	175	113	11	78¼	717	816	Art'burnJ⁵	Mdn	60	Peno118	Principillo118	EdenBelle 8
Apr28-60¹B.M	6 f	1:14 sl	18	115	96¾	78¼	611	512	Ar'burnJ¹¹	Mdn	61	Sals-R'ge115	Sm'lT'wnGirl115	Kylew'd 12
Apr21-60¹B.M	6 f	1:13⅗ft	52	113	55¾	54¾	46½	48¼	Art'rnJ⁷	M5000	67	D'm'dMark118	Kitsimbanyi113	P'n'rJoe 12
Mar29-60⁴B.M	6 f	1:12 ft	110	113	85¾	78¼	79¼	711	Art'burnJ⁸	Mdn	72	KerryPiper118	Graphite118	Nightken 12
Sep 3-59¹Lga	5½ f	1:08⅗gd	59	115	108¼	106¾	1041	55¾	FreyP⁴	M5000	70	Warbr'k118	Mirac'l'm118	Dar'gIntrigue 12
Aug26-59¹Lga	5½ f	1:05⅗ft	41	115	74¾	74¾	9111116		Sim'isG¹²	Mdn	75	JetTiger118	Maleficent118	SeafairQu'n 12
May25-59³E.P	a 3½ f	:42⅕sy	3	⁴118	8		89¼	88¼	MarshW⁷	Mdn	79	GwenethGl'n111	TigerTh'ry118	B'byJoe 8

April 27 BM 3-8 sy :37h — March 23 BM 3-8 ft :35⅗h — March 19 BM 3-4 ft 1:15⅖hg

Tillies Baby — 110

Br. f, 3, by Star Traveler—Till Lykke, by Boxthorn.
Breeder, A. L. Holmes. 1960 1 M 1 0 $425
Owner, A. L. Holmes. Trainer, A. Peters. $5,000 1959 1 M 0 0 ——

May10-60¹B.M	6 f	1:11⅗ft	9¼	110*	11	14	14	2nk	F'zierB²	M5000	85	Pilikia115	TilliesBaby110	Continuity 12
Jly 9-59⁷Pln	5 f	:59⅘ft	12	118	14	12	934	935	M'yh'nB⁵	AlwM	57	Imatz118	Kenty'sLover115	FrenchFilly 9

May 5 BM 3-4 ft 1:15⅘h — April 29 BM 5-8 ft 1:01⅕h — April 18 BM 3-8 ft :36hg

Past Performances—First Race at Bay Meadows on May 13, 1960

Figure 1. A past-performance chart.

PREDICTOR NAME

3 WEIGHT TO BE CARRIED THIS RACE
24 1968; PERCENTAGE OF RACES IN WHICH HORSE FINISHED FIRST,SECOND,OR THIF
55 WEIGHT HORSE CARRIED IN HIS LAST RACE
58 SPEED RATING CORRECTED BY TRACK VARIANT FOR HORSE'S LAST RACE
83 IS THE JOCKEY ONE OF THE LEADING JOCKEYS IN THIS RACE?

RACE 2 5 PREDICTORS

orse's number→	1	2	3	4	5	6	7	8
3	116	116	113	112	111	109	116	116
24	0	50	100	0	50	33	40	50
55	111	112	110	114	110	111	116	116
58	93	95	91	75	90	92	94	96
83	NO	YES	NO	NO	YES	YES	NO	YES

Figure 2. Example of one judge's information set in the 5 predictor condition.

(5)

Figure 3. The same judge's information set in the 40 predictor condition.

	PREDICTOR NAME
3	WEIGHT TO BE CARRIED THIS RACE
24	1968: PERCENTAGE OF RACES IN WHICH HORSE FINISHED FIRST,SECOND,OR THIRD
55	WEIGHT HORSE CARRIED IN HIS LAST RACE
58	SPEED RATING CORRECTED BY TRACK VARIANT FOR HORSE'S LAST RACE
83	IS THE JOCKEY ONE OF THE LEADING JOCKEYS IN THIS RACE?
19	1968: NUMBER OF STARTS
49	NUMBER OF DAYS SINCE HORSE'S LAST RACE
62	NUMBER OF LENGTHS HORSE FINISHED BEHIND LEADER IN LAST RACE
72	SPEED RATING OF HORSE CORRECTED BY TRACK VARIANT IN NEXT-TO-LAST RACE
76	SPEED RATING OF HORSE CORRECTED BY TRACK VARIANT ON SECOND-TO-LAST RACE
5	CLAIMING PRICE THIS RACE
10	HIGHEST CLASS AT AQUEDUCT THIS SEASON
33	1967: PERCENTAGE OF RACES IN WHICH HORSE FINISHED FIRST,SECOND,OR THIRD
47	RANK IN PACE RATING CORR, FOR WT.: BEST RACE THIS YR, AT "A" AT 6F ON FAST TRACK
52	CLASS OF HORSE'S LAST RACE
61	FINISHING POSITION OF HORSE IN LAST RACE
66	NUMBER OF DAYS SINCE NEXT-TO-LAST RACE
68	CLASS OF HORSE IN NEXT-TO-LAST RACE
73	NUMBER OF DAYS SINCE SECOND-TO-LAST RACE
51	WAS HORSE'S LAST RACE RUN AT AQUEDUCT?
1	AGE
2	SEX
8	HIGHEST CLASS ON HORSE'S PAST PERFORMANCE CHART
12	HIEST CLASS AT "A" THIS YR AT 6F W/ FINISH 1,2,3,4 OR W/IN 1/2 LENGTH OF LEADER
20	1968: NUMBER OF WINS
25	1968: TOTAL MONEY WON
28	1967: NUMBER OF STARTS
29	1967: NUMBER OF WINS
34	1967: TOTAL MONEY WON
37	NUMBER OF RACES IN LAST 21 DAYS
40	DISTANCE AT WHICH HORSE HAS RACED MOST OFTEN
41	FASTEST SPEED RATING ON PAST PERFORMANCE CHART FOR RACES OF 6F
54	DISTANCE OF HORSE'S LAST RACE
63	NUMBER OF LENGTHS GAINED OR LOST IN THE STRETCH IN LAST RACE
65	DID HORSE FAIL TO GAIN ON THE LEADER AT ANY CALL IN THE LAST RACE?
67	DISTANCE OF NEXT-TO-LAST RACE
78	DISTANCE OF LAST WORKOUT
79	TIME OF LAST WORKOUT
80	NUMBER OF DAYS SINCE LAST WORKOUT
88	IS THE TRAINER ONE OF THE LEADING TRAINERS IN THIS RACE?

Table 1

Test-Retest Consistency at Low (5 Predictors) and High (40 Predictors) Levels of Information for 8 Subjects (Horse Racing Study)

Index of Reliability	5 Predictors	40 Predictors
1. Changes in first-place selections	9/40 22%	14/40 39%
2. Changes in any of five ranks	91/200 45.5%	121/200 60.5%
3. Differences in ranks*	153	220

*Sum of differences is less for 5 than for 40 predictors in 30/37 races (3 ties)

Conclusion: Expert handicappers are much less consistent with 40 predictor items than with 5 predictor items.

Example: Race N: 5 predictors

	Horse numbers				
First ranking of Race N:	8	3	7	2	4
Second ranking of Race N:	7	3	4	8	2

The first-place horse changed; the horses changed at four out of five ranks; sum of differences = 3+0+2+1+2=8.

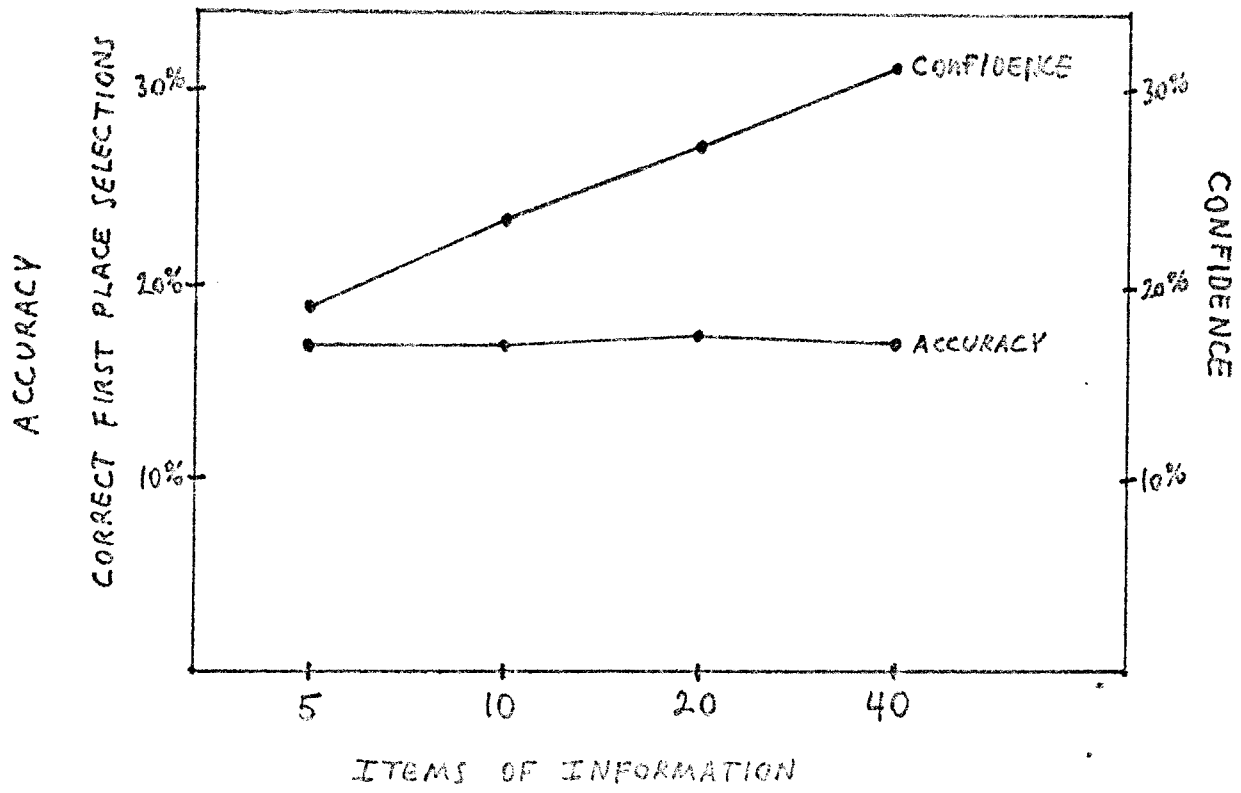


Figure 4. Mean changes in confidence and accuracy with increasing amounts of information.

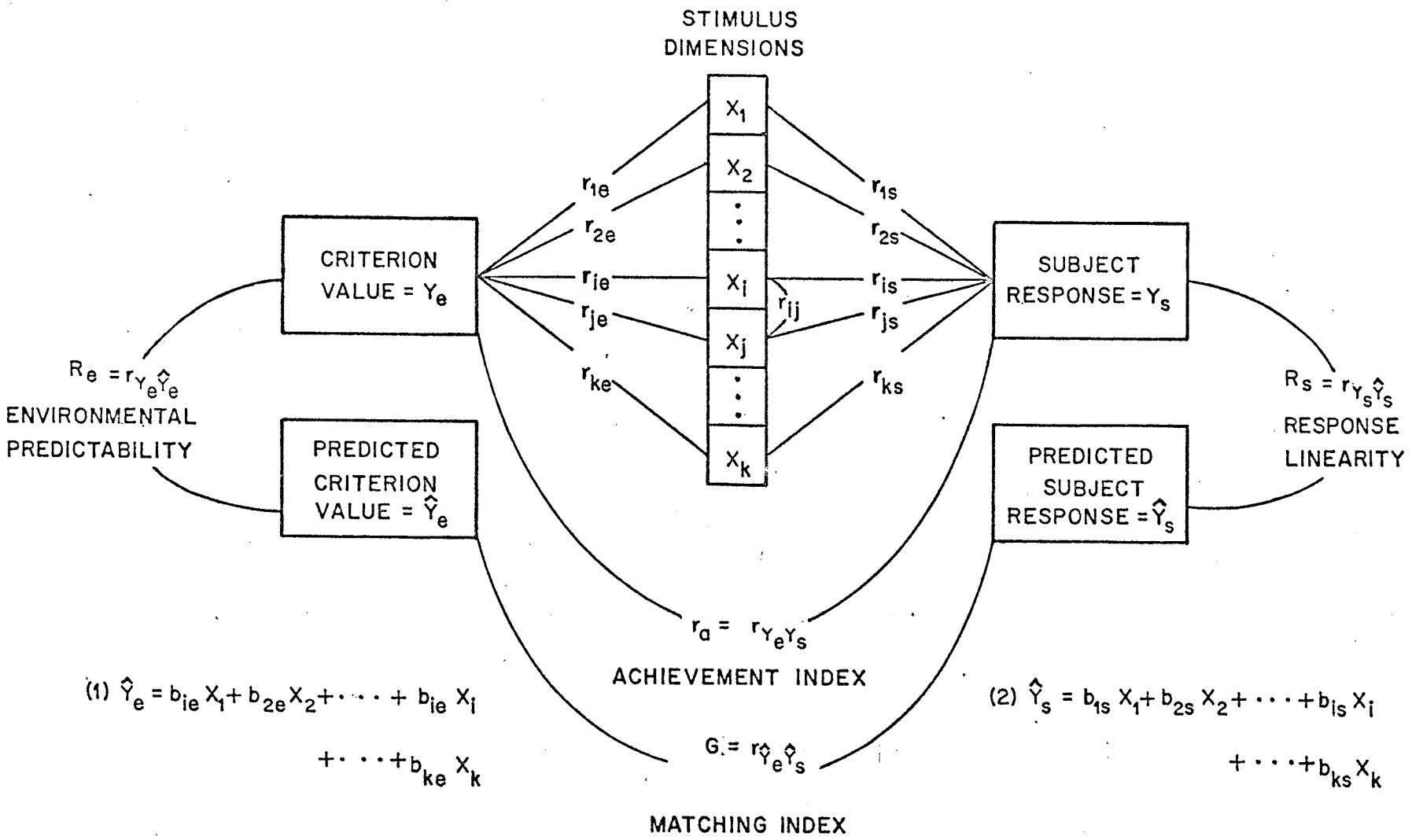


Figure 5. The lens model

b. method of analysis: the "lens model" (see Figure 5)

1. $r_a = r_{Y_e Y_s}$ achievement
2. $G = r_{\hat{Y}_e \hat{Y}_s}$ policy validity (appropriateness of judge's weights and function forms)
3. $R_s = r_{Y_s \hat{Y}_s}$ policy consistency (random error)--index of control
4. $R_e = r_{Y_e \hat{Y}_e}$ environmental consistency
5. $r_a = GR_sR_e$ the lens model equation

c. results

1. subjects gain knowledge of nonlinear policies but predict poorly (low r_a) due to high degree of inconsistency (low R_s - lack of control) in executing the policy.

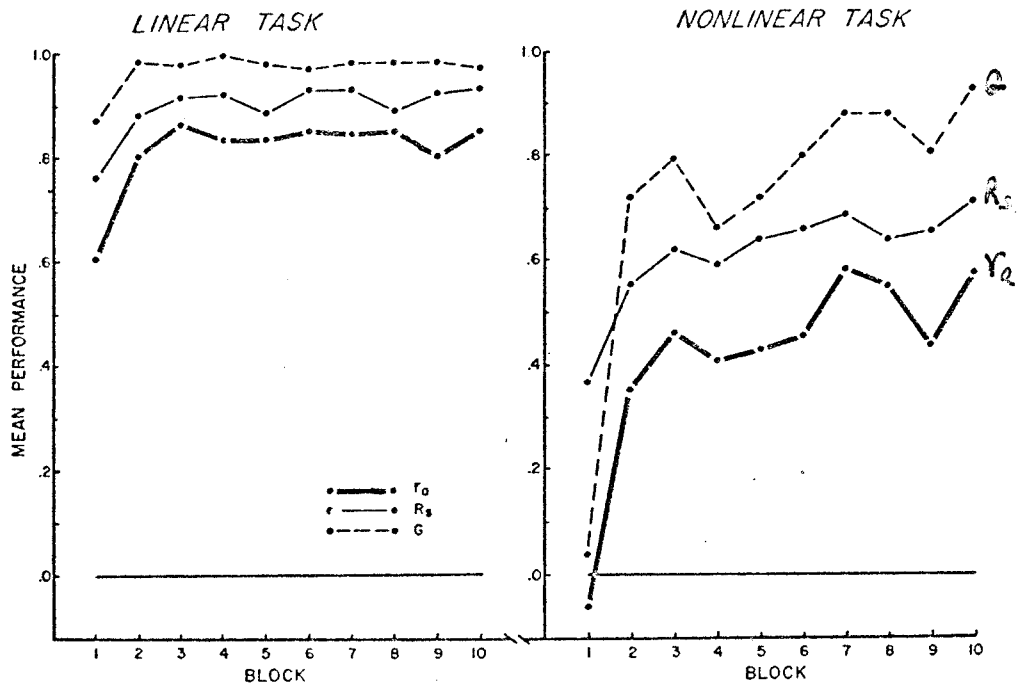


FIG. 6. Indexes of achievement (r_a), knowledge (G), and control (R_s) in two multiple-cue probability learning tasks. (In each task condition, $n = 20$.)

From Hammond & Summers (1972)

2. Outcome feedback impedes control over the execution of one's knowledge in the nonlinear task. (Hammond, Summers, & Deane, 1973)

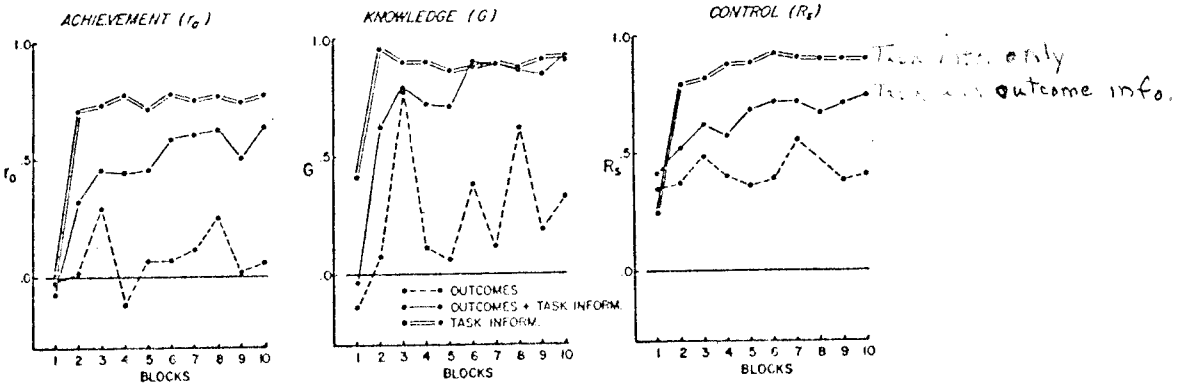


FIG. 7. Mean achievement (r_a), knowledge (G) and control (R_s) indices plotted over blocks of 20 trials according to experimental condition.

3. Brehmer (1971) finds that, even when you tell Ss what weights and functional relationships to employ, they have difficulties being consistent.

C. Systematic biases

1. general hypothesis

Man's limited memory, attention, and reasoning capabilities lead him to apply simple strain-reducing strategies when processing information. While these strategies may be efficient in some situations, in others they induce systematic biases that make the decision maker's actions inconsistent with his "true" preferences or beliefs.

2. Examples a, b, & c. Influence of response mode upon risk-taking decisions

a. When subjects rate the attractiveness of playing a gamble, probability of winning is the most important determiner of their responses; when they estimate the monetary worth of a gamble, payoff dimensions are more important than probabilities (Slovic & Lichtenstein, 1968).

TABLE 2

Percentage of Ss for Whom a Given Risk Dimension Was Most Important

	Risk Dimension			
	P_W	$\$_W$	P_L	$\$_L$
Computed Weights				
Rating Group (N=88)	50	09	15	26
Bidding Group (N=125)	18	19	10	53
Subjective Weights				
Rating Group (N=43)	45	13	26	16
Bidding Group (N=50)	40	18	24	16

b. Given pairs of bets such as those below, subjects in Las Vegas often chose to play Bet A rather than Bet B, but they attached a higher monetary worth to Bet B. Such inconsistencies reflect systematic bias intervening between "true values" and observed preferences. They result from subjects using different information-processing strategies when choosing and setting prices.

Bet A	Bet B
11/12 chance to win 12 chips	2/12 chance to win 79 chips
1/12 chance to lose 24 chips	10/12 chance to lose 5 chips

where each chip is worth 25¢.

c. Individuals' preferences for long-shot bets were assessed by two methods: choices and selling prices--some persons gave selling prices consistent with their choices; others did not (see Figure 8).

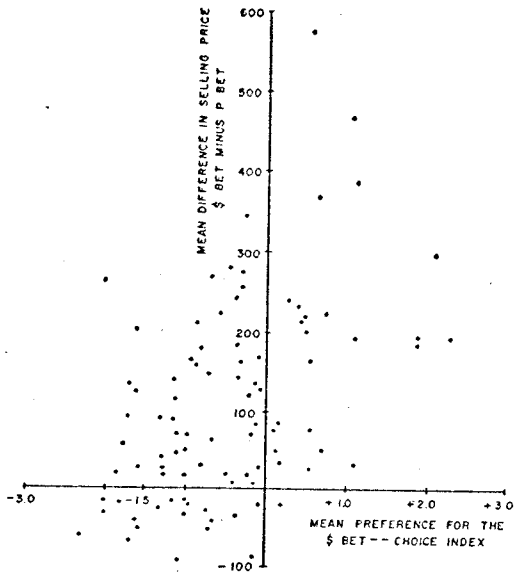


FIG. 8. Relationship between choice and selling-price indexes across the total sample of subjects ($r = .46$).

3. Slovic & MacPhillamy found that dimensions common to each alternative in a choice had greater influence upon decisions than dimensions that were unique to a particular alternative, even though the judges did not wish this to occur.

Table 3

Examples of Stimulus Pairs in the

Equal- and Unequal-Units Conditions

Common Dimension	Unequal-Units Condition			Equal-Units Condition		
	Student →	A	B	Student →	A	B
NAch	NAch	67	59	NAch	618	561
	Eng	___	86	Eng	___	572
	Quant	452	___	Quant	382	___
		A	B		A	B
Eng	NAch	___	33	NAch	___	458
	Eng	119	90	Eng	457	800
	Quant	414	___	Quant	348	___
		A	B		A	B
Quant	NAch	___	27	NAch	___	698
	Eng	74	___	Eng	469	___
	Quant	701	466	Quant	264	388

4. The experiments described above suggest that the compatibility or commensurability between a cue dimension and the required decision affects the importance of that cue in determining the decision.

5. biased perceptions of probabilistic events--"the law of small numbers"

Tversky & Kahneman (1971) observed that people have strong intuitions about random sampling; these intuitions are shared by naive persons and sophisticated scientists, and they are wrong in fundamental ways with resulting unfortunate consequences in the course of scientific inquiry. They concluded that the typical scientist:

a. has undue confidence in early trends from the first few data points and in the stability of observed patterns;

b. rarely attributes a deviation of results from expectations to sampling variability because he finds a causal explanation for any discrepancy.

These results suggest that investors may be too quick to infer that their policies are not working and too quick to change policies to remedy this apparent (but often illusory) failure.

D. Insight into one's own policy

Judges' insight into their own weighting policies is poor. They typically overestimate their weightings of minor cues and fail to recognize the extent to which their judgments can be predicted by only a few cues. Greater experience in the task may lead to poorer self-insight (see Figure 9 and Table 4, taken from Slovic, Fleissner, & Bauman, 1972).

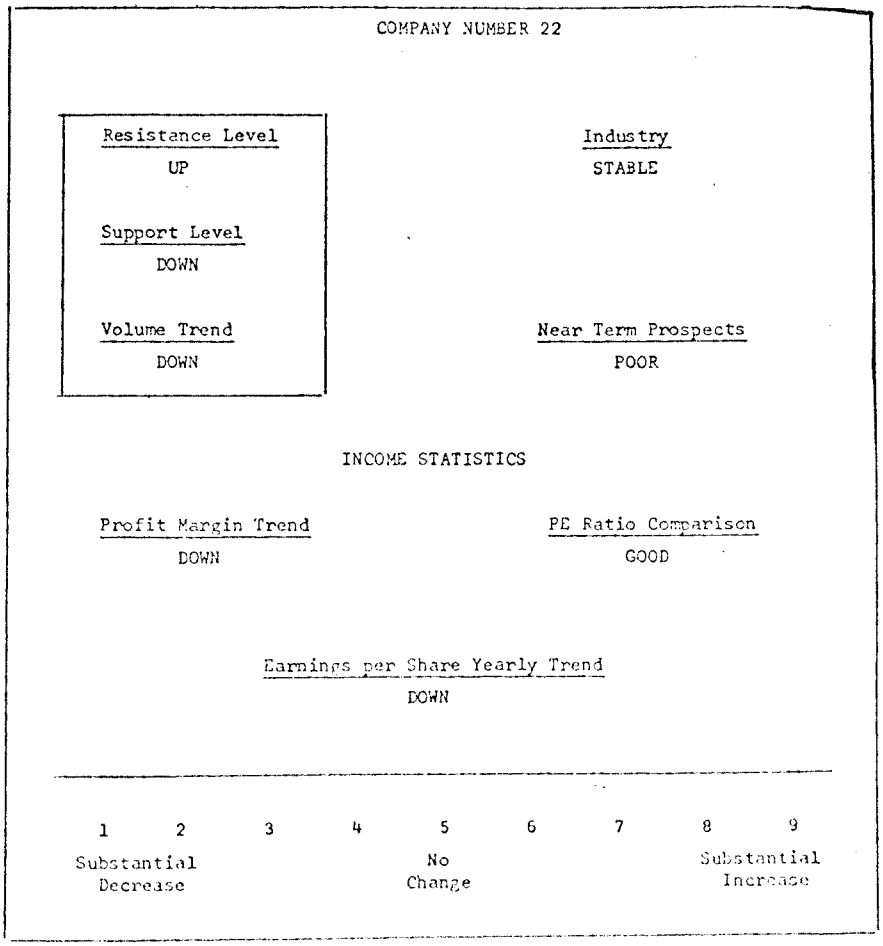


FIG. 9.—Example of a stimulus company. The response scale is at the

Table 4
Comparison between Importance of Effect and
Subjective Weights across Thirteen Brokers and Five Students

Factor	Broker No. 1	2	3	4	5	6	7	8	9	10	11	12	13	Mean for Brokers	Student No. 1	2	3	4	5	Mean for Students
Importance of effect:																				
IND	02	01	09	09	07	03	10	04	04	13	10	14	03	07	03	10	14	04	12	09
RES	12	18	06	01	15	01	09	13	14	06	13	01	03	09	01	11	01	08	05	05
SUPP	**20**	28	06	05	07	11	06	15	07	10	**21**	02	06	11	03	04	06	05	01	04
VOL	16	07	08	13	08	14	06	**18**	13	17	07	02	04	10	14	07	04	02	00	05
NTP	16	07	**27**	**34**	13	14	**25**	16	22	**25**	09	11	15	18	13	07	15	14	00	10
PMT	09	05	05	02	11	20	14	09	10	09	11	24	22	12	13	18	10	17	10	14
PER	13	02	24	14	03	07	09	12	02	09	14	15	23	11	04	12	16	22	33	17
EYT	12	**32**	14	22	**36**	**31**	21	13	**28**	09	14	**32**	**24**	**22**	**48**	**29**	**34**	**29**	**39**	**36**
Subjective weight:																				
IND	15	**25**	10	15	10	**20**	15	**15**	13	15	10	10	15	14	10	03	**20**	09	18	12
RES	08	06	05	00	05	10	10	**15**	08	05	**20**	**20**	05	09	00	01	05	07	03	03
SUPP	08	06	06	00	05	10	10	**15**	08	05	**20**	**20**	10	09	00	01	05	07	03	03
VOL	12	20	09	**20**	10	15	15	05	15	15	**20**	15	10	14	20	05	15	10	03	11
NTP	12	04	**30**	**20**	10	10	**20**	10	**20**	15	05	05	**20**	14	13	10	05	12	15	11
PMT	10	04	05	05	10	15	07	**15**	05	10	05	10	10	08	08	25	10	12	15	14
PER	**20**	10	15	**20**	10	05	15	**15**	11	**20**	10	05	15	13	09	20	**20**	20	**22**	18
EYT	15	**25**	20	**20**	**40**	15	08	10	**20**	15	10	15	15	**18**	**40**	**35**	**20**	**24**	20	**28**

NOTE.—The highest entry in each column is in boldface type.

IV. Facilitating Adherence to Policy

A. If a decision maker is to approach subjective optimality (a condition wherein his actions are consistent with his underlying values and beliefs), random errors and systematic biases must be minimized.

B. Eliminating random error by "bootstrapping"

The judge's policy equation may do a better job of predicting some outcome or implementing the judge's personal values than the judge himself could do.

". . . humans tend to generate 'correct' strategies but then, in turn, fail to use their own strategy with any great consistency. ... One is left with the conclusion that humans may be used to generate inference strategies but that once the strategy is obtained the human should be removed from the system and replaced by his own strategy [Dudycha & Naylor, 1966]."

C. Analytic thinking--the decomposition principle

"The spirit of decision analysis is divide and conquer: Decompose a complex problem into simpler problems, get your thinking straight in these simpler problems, paste these analyses together with a logical glue, and come out with a program for action for the complex problem. Experts are not asked complicated, fuzzy questions, but crystal clear, unambiguous, elemental, hypothetical questions [Raiffa, 1968]."

D. Cognitive feedback

Hammond (1971) demonstrates that computerized feedback, showing the judge how his judgment policy compares to the desired policy, leads to dramatic increases in ability to execute a policy with consistency and precision. (See Figures 10, 11, and 12.)

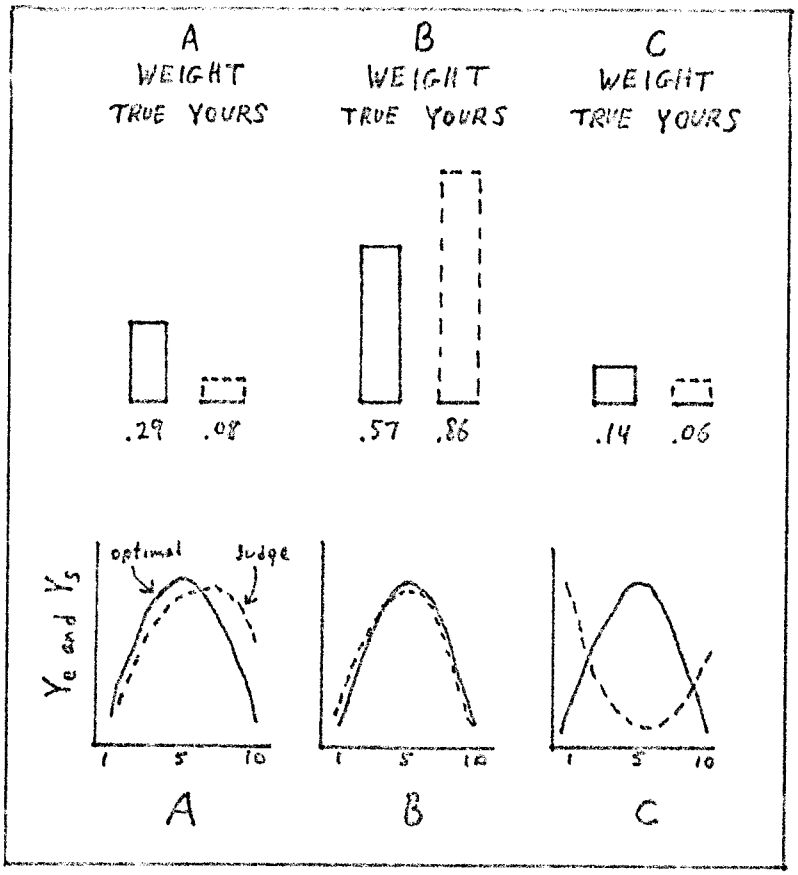


Figure 10. Cognitive feedback displays for a multiple-cue learning task.

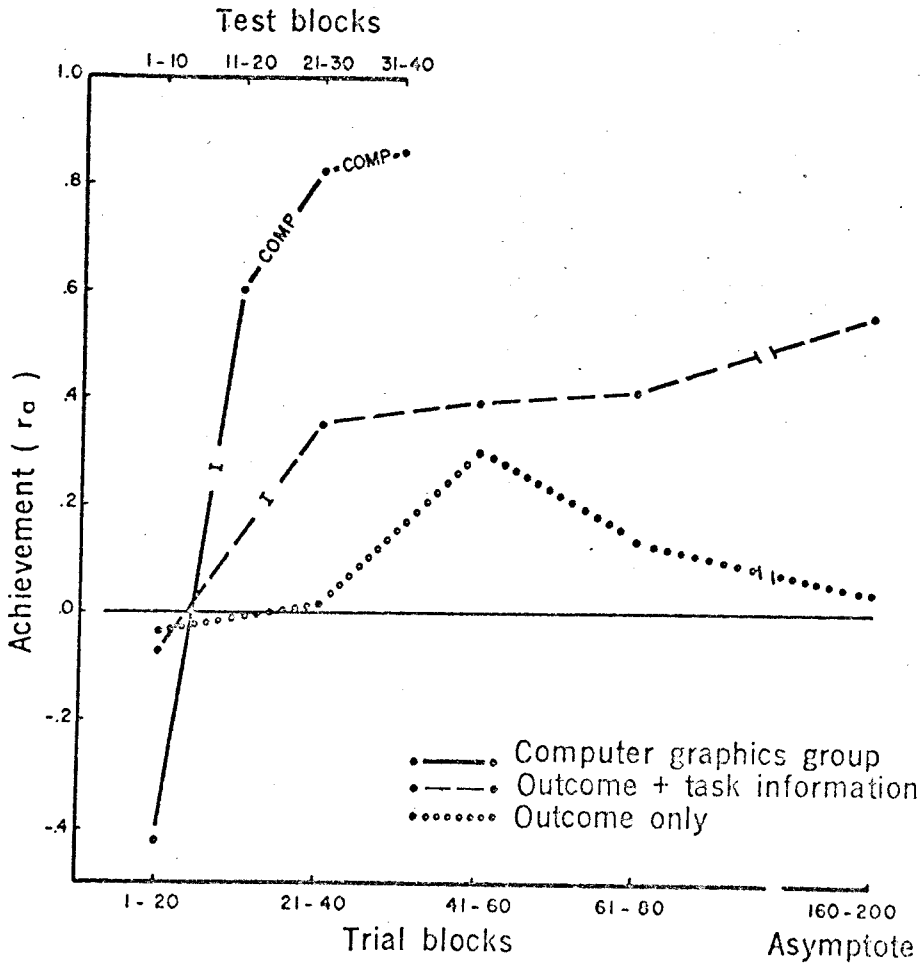


Figure 11. Learning curve for computer graphics group compared with groups receiving other forms of feedback.

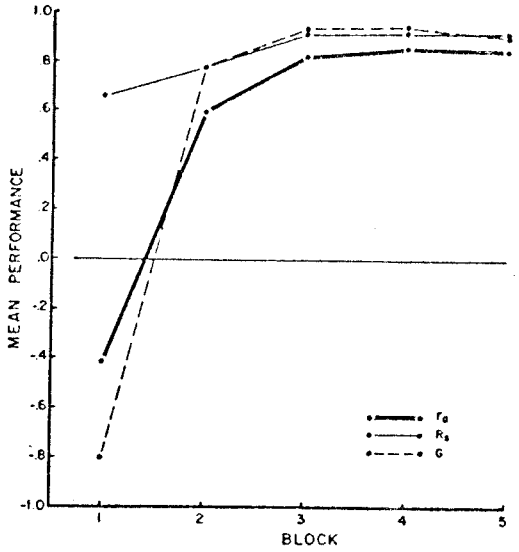


FIG. 12. Indexes of achievement (r_a), knowledge (G), and control (R_s) in a nonlinear inference task when cognitive feedback is presented in the form of graphic displays. (Block = 10 trials.)

V. References

A. A general introduction to this type of research is provided in the article: Slovic, P. Psychological study of human judgment: Implications for investment decision making. The Journal of Finance, 1972, 23, 779-799.

B. I will be happy to supply additional references for the work described in this talk.