APPENDICES

TO

"AN INVESTIGATION OF PREDICTION OF SUCCESS IN NAVAL FLIGHT TRAINING"

by

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Committee on Aviation Psychology

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LETTER OF TRANSMITTAL

NATIONAL RESEARCH COUNCIL

2101 Constitution Avenue, Washington, D. C.
Division of Anthropology and Psychology

Committee on Aviation Psychology

December 17, 1948

Dr. Dean R. Brimhall
Civil Aeronautics Administration
Room 5217, Commerce Building
Washington 25, D. C.

Dear Dr. Brimhall:

In the attached publication are presented the Appendices to the report, entitled An Investigation of Prediction of Success in Naval Flight Training, representing the results of two studies conducted by J. E. Finesinger, M.D., Stanley Cobb, M.D., Eliot D. Chapple, Ph.D., and their associates, under a grant to the Massachusetts General Hospital. This publication is submitted with the recommendation that it be included in the series of Technical Reports of the Division of Research, Civil Aeronautics Administration.

This publication embodies materials pertinent to the administration of the tests and analysis of the data, which were too voluminous to be included in the report proper. Separate publication of this material is indicated in the interest of presenting all supplementary information relating to the study, and because of their interest from the viewpoint of methodology.

Cordially yours,

MSV:rm

Morris S. Viteles, Chairman
Committee on Aviation Psychology
National Research Council

EDITORIAL FOREWORD

In this publication are included the Appendices to the report An Investigation of Prediction of Success in Naval Flight Training, by J. E. Finesinger, Stanley Cobb, Eliot D. Chapple, and their associates, which has been published as Report No. 81 in the Technical Series of the Division of Research, Civil Aeronautics Administration.

These Appendices include detailed directions for the administration of tests employed in the original Squantum study, discussed in Part I of the report proper, as well as other supplementary materials. Such materials were too voluminous to permit publication with the report itself. They are being published separately in the form of Appendices, in the interest of presenting all information pertinent to the administration of the tests and to the analysis of the data.

Appendices B, C, E, G, and I were prepared in the main by the principal investigators. The criterion data presented in Appendix A were made available by the United States Navy. Appendix D was prepared by Dr. Leon Festinger, of the Statistical Office of the Committee on Aviation Psychology. Appendices F and H were prepared by the Statistical Office of the Committee on Aviation Psychology in cooperation with the principal investigators.

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APPENDIX A

(Supplementary to Section 1, Part I)

Criterion data for individual cadets, listed in order of testing.

APPENDIX A

CRITERION DATA FOR INDIVIDUAL CADETS, LISTED IN ORDER OF TESTING

Subject	Pass (P) or Reason for Elimination	Time of Elimination*	No. Ground School Courses Failed
1	P	P	7
2	P	P	1
3	P	P	2
4	P	P	1
5	P	P	3
6	P	P	-
7	Own Request	33-Hour Recheck,P.T.	1
8	P	P	0
9	P	P	7
10	P	P	0
11	P	P	1
12	P	P	2
13	P	P	1
14	P	P	1
15	Flight Checks	20-Hour Recheck,P.T.	2
16	P	P	1
17	P	P	1
18	P	P	0
19	P	P	4
20	P	P	7
21	P	P	1
22	P	P	3
23	Flight Checks	33-Hour Check,P.T.	0
24	Flight Checks	Advanced Trng.	-
25	P	P	5
26	P	P	8
27	Flight Checks	Elimin. Trng.	-
28	P	P	5
29	Flight Checks	Elimin. Trng.	-
30	P	P	-

*P. T. = Preliminary Training

APPENDIX A (Continued)

CRITERION DATA FOR INDIVIDUAL CADETS, LISTED IN ORDER OF TESTING

Subject	Pass (P) or Reason for Elimination	Time of Elimination*	No. Ground School Courses Failed
31	P	P	1
32	P	P	0
33	P	P	3
34	P	P	0
35	Flight Checks	Intermed. Trng.	5
36	P	P	2
37	P	P	1
38	P	P	6
39	P	P	1
40	P	P	1
41	P	P	2
42	P	P	0
43	P	P	0
44	P	P	3
45	P	P	-
46	P	P	8
47	P	P	0
48	Own Request	Advanced Trng.	3
49	P	P	0
50	P	P	0
51	P	P	0
52	P	P	3
53	P	P	5
54	P	P	1
55	NO RECORD		
56	P	P	4
57	P	P	7
58	P	P	0
59	P	P	6
60	P	P	1

*P. T. = Preliminary Training

APPENDIX A (Continued)

CRITERION DATA FOR INDIVIDUAL CADETS, LISTED IN ORDER OF TESTING

Subject	Pass (P) or Reason for Elimination	Time of Elimination*	No. Ground School Courses Failed
61	P	P	2
62	P	P	3
63	P	P	4
64	P	P	2
65	P	P	3
66	P	P	2
67	P	P	-
68	P	P	6
69	P	P	8
70	P	P	7
71	P	P	0
72	Not Officer Mat.	Elimin. Trng.	-
73	P	P	0
74	Flight Checks	20-Hour Recheck,P.T.	4
75	P	P	0
76	P	P	4
77	P	P	-
78	P	P	3
79	P	P	-
80	P	P	0
81	P	P	5
82	P	P	0
83	P	P	-
84	Airsickness	Elimin. Trng.	-
85	Flight Checks	Elimin. Trng.	-
86	Flight Checks	33-Hour Recheck,P.T.	3
87	P	P	1
88	Flight Checks	Elimin. Trng.	-
89	P	P	1
90	Flight Checks	33-Hour Recheck,P.T.	0

*P.T. = Preliminary Training

APPENDIX A (Continued)

CRITERION DATA FOR INDIVIDUAL CADETS, LISTED IN ORDER OF TESTING

Subject	Pass (P) or Reason for Elimination	Time of Elimination*	No. Ground School Courses Failed
91	P	P	-
92	P	P	5
93	P	P	1
94	P	P	2
95	Ground School	Final Prim. Land Plane Check	8
96	P	P	3
97	P	P	5
98	P	P	-
99	Flight Checks	Elimin. Trng.	-
100	Flight Checks	Elimin. Trng.	-
101	P	P	0
102	Ground School	33-Hour Check, P.T.	6
103	Flight Checks	33-Hour Check, P.T.	5
104	P	P	0
105	P	P	1
106	Flight Checks	20-Hour Recheck, P.T.	1
107	P	P	1
108	P	P	0
109	P	P	0
110	P	P	-
111	Flight Checks	Elimin. Trng.	-
112	P	P	0
113	P	P	-
114	P	P	3
115	P	P	-
116	P	P	1
117	P	P	-
118	Disciplinary	Elimin. Trng.	2
119	P	P	-
120	P	P	0

*P. T. = Preliminary Training

APPENDIX A (Concluded)

CRITERION DATA FOR INDIVIDUAL CADETS, LISTED IN ORDER OF TESTING

Subject	Pass (P) or Reason for Elimination	Time of Elimination*	No. Ground School Courses Failed
121	P	P	-
122	Flight Checks	Elimin. Trng.	-
123	P	P	0
124	P	P	0
125	P	P	-
126	P	P	2
127	Flight Checks	33-Hour Recheck,P.T.	3
218	P	P	0
129	Flight Checks	Elimin. Trng.	-
130	Flight Checks	33-Hour Recheck,P.T.	3
131	P	P	-
132	P	P	-
133	P	P	-
134	P	P	-
135	P	P	-
136	Flight Checks	Elimin. Trng.	-
137	P	P	-
138	Flight Checks	Elimin. Trng.	-
139	P	P	-
140	P	P	-
141	Flight Checks	33-Hour Recheck,P.T.	3
142	P	P	-
143	P	P	-
144	Ground School	20-Hour Recheck,P.T.	3
145	P	P	-
146	Not Officer Mat.	20-Hour Recheck,P.T.	3
147	P	P	-
148	Own Request	Elimin. Trng.	-
149	P	P	-
150	Flight Checks	Elimin. Trng.	0
151	Flight Checks	Elimin. Trng.	-

*P. T. = Preliminary Training

APPENDIX B

(Supplementary to Section 2, Part 1)

1. Questions and statements on each topic in standard interviews. 11

2. Descriptive statements used to guide interviewers in making ratings 1-6, 8-9. 13

3. Sheet used in scoring questionnaire 19

4. Questionnaire items, showing number and per cent of cadets giving each answer. 20

APPENDIX B-1

QUESTIONS AND STATEMENTS USED IN STANDARD INTERVIEW

Childhood History

Was your childhood happy? Do you think that you were like other children?

There are some children that struggle with difficulties of many kinds. They find it hard to talk to their parents about them and often feel hesitant with their friends at home and at school. Do you remember any such experiences?

Did you sleep well or did you often lie awake? Were you afraid of the dark or worried about wetting the bed? Do you remember having bad dreams or waking up crying and frightened?

What parent or adult in your childhood meant most to you? Whom did you want to be like?

Were there hesitancies about going to the bathroom; fussing about food; temper tantrums; feelings of loneliness? If you felt upset or angry what happened? What did you do about it? If you had an upset what would happen at home about it?

2. School and Job History

Do you look back at school as a happy period in your life? How did you hit it off with the people there? Were you inclined to be a leader or one of the gang?

Did you like studying or did you have more fun playing around with the others? Did you do equally well all the time? How far did you go in school and what did you do when you finished?

Was it hard to get a job and how long did you hold on to the job? Was it easy to work under a boss and how did you hit it off with superiors and other workers?

Did you get much satisfaction out of your jobs and are you satisfied to continue the work that you are doing? What did you consider satisfactory work for you in life?

3. Medical History

Do you consider yourself a healthy person? Were there periods in your life when you were very sick, and are there periods when you feel down and not very energetic? Have you been in hospitals much, and how did you like it?

Did the family worry if someone was sick? Was there a good deal of talk about doctors and illnesses at home? Did you have to worry about the sickness of someone else in the family?

Has anyone in your intimate family died, and how did you react to it? How do you react to sick people?

4 Symptoms

Are you able to control your feelings or do you find at times that you feel uncomfortable in some situations?

How do you feel in talking about these things to me?

Are there any situations which disturb you more than they should? For instance, examinations, or being in the dentist's chair? Do you ever have feelings of being scared or jittery when there is no good reason? Do you ever feel down in the dumps for no good reason? Do you have difficulty in making up your mind? Are you easy going about things?

Do you think you are a lucky person? What is your idea about superstitious people?

5. Personality

Are you satisfied with yourself as a person?

Are you a sensitive person or are you inclined to take things easily? Are you easily thrown out of gear or can you take things in your stride?

Do you feel at ease in a group? Or do you have your best times alone? Do you feel up to par or do you have feelings of not being as good as others? Do you feel that the rest of the crowd likes you?

Do you have a lot of push or do you like to take time to relax?

Are you influenced by the opinions of others or do you stick up for yourself? Do you figure things out for yourself or do you go in for pipe dreams?

6. Sexual and Emotional Adjustment

How do you get along with girls? Tell me something about the first date you ever had. Do you have a steady girl or do you go about socially a good deal with girls?

Is your family interested in your attitude towards girls at present or even when you were younger?

Have you ever thought of settling down and having your own home?

What are your ideas about intercourse before marriage? Have you had much difficulty with the masturbation problem?

How are things going at Squantum?

APPENDIX B-2

DESCRIPTIVE STATEMENTS USED TO GUIDE INTERVIEWERS IN ASSIGNING RATINGS ON ITEMS 1-6, 8-9.[1]

1. Scoring of Childhood History

Rating 1: Individuals with a happy childhood who described no difficulties or hesitancies with their parents or friends, who reported no early neurotic symptoms or traits.

Rating 2: Individuals with a happy childhood, who had little difficulty with their parents and reported a single symptom or neurotic trait, and did not remember much concern about this symptom or trait.

Rating 3: Individuals who were not sure that their childhood had been a happy one. There were distinct difficulties with their parents and several neurotic traits or symptoms were reported. These were of some concern, yet were not considered as hampering the subject.

Rating 4: Individuals whose childhood had been unhappy and who had many difficulties of adjustment with their family. There were many and repeated neurotic symptoms and traits, which were of great concern to them.

Rating 5: Individuals whose childhood had been unhappy, and who showed evidence of marked maladjustment to their families. They had many neurotic symptoms and traits about which physicians had been consulted. These symptoms were chronic and intense, and were the source of distress to the subject.

2. Scoring of School and Job History

Rating 1: Individuals whose school life was happy, who enjoyed studying, and who had no difficulty in being promoted. They had friends, and got along well with their teachers. There was evidence of planning in their school work, so that it led to a job or to further school work. They were interested in their work and obtained satisfaction from it. They had no difficulties in adjusting to job conditions and to their superiors.

Rating 2: Individuals whose school life was happy but who were not interested in studying. They had no difficulty in being promoted in school. There was not much evidence of planning or of a goal in their schoolwork. They were not too interested in their work but seemed to get along in it, without much zeal or satisfaction.

Rating 3: Individuals whose school life was not considered happy. They were not interested in study and had difficulties in being promoted. They were able to make good social contacts and got along well with their fellow students.

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[1] Scoring of Items 7 and 10 is described in Section 2.

They managed, however, to graduate from high school or preparatory school. They showed little evidence of planning or of a goal. They accepted jobs and got along with their superiors, but got little satisfaction from their jobs.

Rating 4: Individuals whose school life was not considered happy. Their school and job work was essentially the same as those in Rating 3. However, they had difficulty in their social contacts, and made few friends. The whole school period was unhappy from the academic as well as the social point of view.

Rating 5: These were individuals who failed repeatedly in school. They had little social contact with fellow students. They made few friends at school and had repeated difficulties with their instructors. They had difficulties in obtaining jobs and had frequent changes in their work. These changes were as a rule due to difficulties in personal adjustment. They joined the Navy for lack of anything better to do.

Scoring of Medical History

Rating 1: These were individuals who had little sickness themselves, and there was little sickness in their families. They had little if any hospital experience. Their energy level seemed at an even keel. There was little talk or worry in the family about doctors and illnesses. Their reaction to sickness or death in the family was reasonable and they showed little preoccupation with these problems.

Rating 2: Individuals who had little sickness themselves and had little personal hospital experience. There was considerable illness in the family, yet they were not disturbed or preoccupied by it. Their energy level showed no striking variations. In spite of serious illness in the family there was no chronic worry about illness and doctors. They were disturbed by deaths in the family. These disturbances were for short periods of time, and they adjusted reasonably well to these crises.

Rating 3: These were people who had considerable sickness themselves and in their families. Their reaction to these experiences were reasonable. There was little preoccupation with sickness or doctors. Their energy level showed some variation, but they were not disturbed by this. Their reaction to deaths and to serious illness in the family were not unusual.

Rating 4: These were people who had serious illness or operations themselves or in their families. They had considerable hospital experience and were disturbed by it. Sickness and doctors were common topics for discussion at home, and they showed undue concern toward illness. They had marked shifts in their energy levels. They were markedly disturbed by deaths in the family, and could not refer to them without a marked affective reaction. Sickness or sick people were a source of concern with them.

Rating 5: These were people who had considerable illness themselves or in their families. They were handicapped in their school life and in their jobs by illness. There was a great deal of preoccupation with illness.

Doctors, medicines, and sickness were frequently discussed at home with a great deal of worry and concern. They had marked fluctuations in their energy level. Their reactions to deaths in the family were severe and formed a topic of concern. They could not discuss events associated with death without affect.

4. Scoring of Symptoms

Rating 1: These were people who stated that they could always control their feelings and felt free in talking about them. There were no overt symptoms of anxiety or depression. They had no difficulty in making up their minds and were easy-going about things.

Rating 2: Individuals who stated that as a rule they could control their feelings and felt free in talking about most things. Yet there were some topics which they would prefer not to talk about. Most situations did not disturb them. There were no feelings of anxiety, or of being scared without a stimulus. They would occasionally have mild depressive feelings, but always for a good reason. They had no difficulties in making up their minds, and stated that they were easy-going about things.

Rating 3: These were people who admitted that there were certain situations which disturbed them and that in these situations they were not sure they could control themselves. They could talk readily about most things. At times examinations would disturb them. Occasionally they would have periods of feeling uneasy and high-strung, at times even jittery. Sometimes there were reasons for this and at other times the reasons were not clear. They would feel mildly depressed at times. These depressed feelings were not severe and lasted from minutes to hours. There was as a rule a known reason for these feelings. At times it was difficult for them to make up their minds, and as a rule they were easy-going about things.

Rating 4: These were people who felt uncomfortable in many situations and had difficulty in controlling themselves. They hesitated in discussing these matters. There were many situations which disturbed them and gave them definite anxiety feelings. In addition there were frequent episodes of anxiety feelings, palpitation and jitteriness for no good reason. There were periods during which they felt depressed for days. These periods were as a rule precipitated by definite events, but at times no reason could be found for them. There was no sleep disturbance or suicidal ideas. They had difficulty in making up their minds, and this at times was a problem for them. They were inclined to be superstitious.

Rating 5: These were individuals who could be clinically diagnosed as having a frank psychoneurosis. The diagnosis was hysteria, anxiety neurosis, reactive depression or compulsive neurosis. Their symptoms were a distinct source of worry and resulted in handicapping them in many activities.

5. Scoring of Personality

Rating 1: Individuals who took themselves for granted, with some insight and understanding. They were not sensitive about personal matters. They socialized well, had no feelings of inferiority. They could have a good

time by themselves but preferred friends. They had considerable push and drive but could also relax. They were conscious of the opinion of others but not dependent upon them, and could stick up for themselves. They tended to have self-confidence and realized when they were constructing pipe dreams.

Rating 2: Individuals who were satisfied with themselves, without much insight or understanding. They were not sensitive about personal matters, but at times were thrown out of gear by events. They socialized well, had no feelings of inferiority. They felt at ease in most groups and could have a good time by themselves as well. They were inclined to be dependent upon the opinions of others.

Rating 3: These were people who at times were not satisfied with themselves. They were sensitive but not readily thrown out of gear. They felt at ease in most groups, and could also have a good time alone. At times there were definite inferiority feelings, but these were based on good reasons. These individuals were inclined to be dependent. They could figure things out for themselves. They were inclined to have pipe dreams but realized their own personal limitations.

Rating 4: These people were not satisfied with themselves. They were sensitive and readily thrown out of gear. They felt ill at ease in most groups and preferred to be alone. They had definite feelings of inferiority at times for no good reason. They were dependent, had difficulty in sticking up for themselves. It was hard to figure out things for themselves. A great deal of time was spent in phantasy and pipe dreams. They had set goals for themselves far beyond their capacity.

Rating 5: These were extremely sensitive people, who were readily disturbed by the opinions of others. They rarely were at ease in a group and preferred to be alone. They had marked inferiority feelings, which they tended to hide by finding fault with the outside world. They felt distinctly disliked. They tended to have difficulty in relaxing. They would battle the opinions of others and would be preoccupied with phantasy. They had distinct paranoid tendencies.

6. Scoring of Sexual and Emotional Adjustment

Rating 1: These were men who got along easily with girls. They had many friends among girls and could talk readily about their experiences. The family was interested in their attitude, yet rarely interfered with their behavior. They had a single standard for both sexes. They had ideas of eventually getting married and settling down. They discussed masturbation with some hesitation, mentioned difficulties in connection with it, but seemed not to be disturbed by the problem.

Rating 2: Individuals who got along easily with girls and could talk freely about their experiences. They could not be completely open with their families, although the family had never interfered with their behavior. As a rule they had a single standard for both sexes. They had ideas of eventually getting married and settling down. They discussed masturbation and seemed not disturbed by the problem.

Rating 3: Individuals who were shy with girls but went out a good deal. They could talk freely about their experiences. They were uncomfortable about the family attitude and could not be completely open in discussing their affairs. They planned eventually to get married and settle down. There was difficulty with masturbation problems during adolescence, resulting in feelings of guilt. At present they seemed to be free from the problem.

Rating 4: Individuals who had little contact with girls. They were extremely shy and avoided discussing the topic. Their families were rigid and they felt that the sex topic could not be discussed with other individuals in the family. They thought of ultimately settling down and getting married. They either denied masturbation, blushed when they talked about it, or else stated that they had marked guilt or felt that masturbation resulted in lasting harm to the individual.

Rating 5: These were people who were hostile toward girls. They did not discuss the problem with anyone. They felt that they did not want to get married. As a rule they denied having masturbated. The whole topic was discussed with affect.

8. Scoring of Subject's Attitude to Interview and Interviewer

Rating 1: Individuals who try to cooperate by following the instructions, taking the interview seriously and responding openly and freely to the various procedures.

Rating 2: Individuals who cooperate, but seem cautious. They meet all of the topics and do not seem to try to impress the interviewer.

Rating 3: Individuals who cooperate but are on guard. They wonder if the test will be used in determining their grades at the flight school. They are not sure how much the interviewer can be trusted.

Rating 4: Individuals who do not cooperate. They talk, as it were, under orders. They avoid personal material, material that is critical of the flight preparatory school. They do not trust the interviewer, and seem to be sure not to "let out too much."

Rating 5: Individuals who joke about the test, answer indifferently, or with obvious hostility. They take the interview as a joke or an FBI investigation.

9. Scoring of Communication

Rating 1: Subjects who talk readily on all topics. There is little hesitation in speech even when dealing with personal topics. There are no long latency periods, no evasions, no attempts to change the subject or to misconstrue the question.

Rating 2: Subjects who talk readily on most topics. There is hesitation when dealing with personal topics, especially the sex topic. There are no long latency periods, no evasions, and no attempts to change the subject or to misconstrue the question.

Rating 3: Subjects who talk readily on most impersonal topics. They hesitate on personal topics, but do not evade them. There are latency periods in connection with personal topics.

Rating 4: Subjects who talk with difficulty about most topics. There is hesitation in speech and embarrassment. Long latent periods are seen. There is some attempt at evasion.

Rating 5: Subjects who talk with difficulty about most topics. In addition to hesitating they tend to evade the topic, change the subject, and misconstrue the question.

APPENDIX B-3

SHEET USED IN SCORING QUESTIONNAIRE

Name: Dates: Examiner:

Quest. #	Yes	No	Doubtful	Ques. #	Yes	No	Doubtful
1	◦	•	◦	51	•	◦	◦
2	◦	•	◦	52	•	◦	◦
3	•	◦	•	53	◦	•	◦
4	◦	◦	•	54	•	•	◦
5	•	•	•	55	◦	•	◦
6	•	•	◦	56	◦	•	◦
7	•	◦	•	57	◦	◦	•
8	•	•	•	58	•	◦	•
9	◦	•	◦	59	◦	•	•
10	•	•	•	60	◦	•	•
11	•	•	◦	61	•	•	•
12	•	•	•	62	•	◦	•
12A	•	•	◦	63	•	•	•
13	◦	•	◦	64	◦	•	•
14	•	•	•	65	•	•	•
15	•	•	◦	66	•	◦	◦
16	•	◦	•	67	◦	•	•
17	•	◦	•	68	◦	◦	◦
18	•	•	•	69	◦	•	•
19	•	•	◦	70	◦	◦	◦
20	•	•	◦	71	◦	•	◦
21	•	•	◦	72	◦	•	◦
22	•	•	•	73	•	◦	◦
23	•	•	•	74	•	•	◦
24	•	•	•	74A	•	•	◦
25	◦	•	•	75	◦	•	◦
26	•	•	•	76	•	◦	◦
27	◦	•	•	77	•	•	◦
28	◦	•	•	78	•	◦	◦
29	◦	◦	•	79	•	◦	◦
29A	◦	◦	•	80	•	◦	◦
30	•	•	•	81	•	•	•
31	•	◦	•	82	•	◦	•
32	•	•	◦	83	◦	•	•
33	•	•	•	84	◦	•	◦
34	•	•	•	85	•	•	◦
35	•	•	◦	86	•	•	◦
36	•	•	•	87	◦	◦	•
37	•	•	◦	88	•	•	•
38	•	•	◦	89	◦	◦	•
39	•	•	•	90	◦	•	•
40	•	•	•	91	•	•	◦
41	•	◦	•	91A	◦	•	◦
42	◦	•	•	92	◦	•	•
43	◦	•	•	93	◦	◦	•
44	•	•	•	94	◦	◦	◦
45	◦	•	•	95	◦	◦	•
46	◦	•	•	96	◦	◦	◦
47	◦	•	◦	97	•	◦	◦
48	•	◦	◦	98	•	•	•
49	◦	•	◦	99	•	•	•
50	•	•	◦	100	•	•	•

APPENDIX B-4

NUMBER AND PER CENT OF CASES ANSWERING "YES," "NO," AND "QUESTIONABLE" TO EACH ITEM IN THE QUESTIONNAIRE*

		YES		NO		QUESTIONABLE	
		No.	%	No.	%	No.	%
1.	Do you get scared easily?	5	3	137	91	9	6
2.	Are you nervous?	23	15	104	69	25	16
3.	Do you have headaches?	26	17	116	77	9	6
4.	Do you have palpitation?	21	14	117	77	13	9
5.	Do you have shortness of breath?	9	6	131	87	10	7
6.	Do you have any feelings of distress in your chest?	9	6	133	89	8	5
7.	Do you have any choking feelings?	8	5	141	94	2	1
8.	Do you feel jittery?	14	9	111	74	25	17
9.	Do you startle easily?	24	16	105	69	22	15
10.	Do you get irritated easily?	22	15	100	67	28	18
11.	Do you feel sometimes that something terrible is going to happen?	15	10	125	83	10	7
12.	Are you able to concentrate on your work?	111	74	20	13	20	13
12A.	How are your spirits?						
13.	Were you a nervous youngster?	28	19	108	72	14	9
14.	Did you have any fears during childhood?	49	32	84	56	18	12
15.	Did you wet your bed?	42	28	106	70	3	2
16.	Did you have temper tantrums?	29	19	114	76	7	5
17.	Were you a finicky eater?	46	31	97	64	8	5
18.	Did you have frightening dreams?	51	34	84	56	15	10
19.	Did you bite your nails?	59	39	89	59	3	2
20.	Were you ever easily scared?	24	16	111	73	16	11
21.	Were you shy?	83	55	51	34	17	11
22.	Did you have difficulties with your parents?	13	9	135	89	3	2
23.	Were you ever afraid of animals?	22	15	119	79	9	6
24.	Did you ever have odd feelings in elevators?	62	42	84	56	3	2
25.	Were you ever afraid of being in a closed room?	16	11	130	86	4	3

*Questions indicated as 12A, 23A, etc. are questions which could not be answered by "Yes" or "No." They were included to find out whether the cadets were actually reading the questions. Most cadets asked the interviewer how to answer these questions. The cadet was told to neglect the card and continue the test.

		YES		NO		DOUBTFUL	
		No.	%	No.	%	No.	%
26.	Were you ever afraid of high places?	27	18	110	73	14	9
27.	Were you ever afraid of the dark?	51	34	87	57	13	9
28.	Were you ever afraid of going out alone?	33	22	107	71	11	7
29.	Were you ever disturbed in crowds?	32	21	108	72	11	7
5A.	How do you feel?						
30.	Do you have fainting spells?	1	1	150	99	0	0
31.	Do you have shaking spells?	4	3	146	96	1	1
32.	Have you ever been paralyzed?	1	1	150	99	0	0
33.	Have you ever been unable to use your arms and legs properly for no good reason?	9	6	141	93	1	1
34.	Do you have any pains or aches for no known reason?	9	6	140	93	2	1
35.	Do you have spells of vomiting?	3	2	148	98	0	0
36.	Did you ever have periods of temporary blindness?	1	1	149	99	0	0
37.	Did you ever have any trouble with your speech?	20	13	121	80	10	7
38.	Do you have feelings of numbness anywhere?	5	4	146	96	0	0
39.	Did you ever have feelings of numbness anywhere?	12	8	138	92	0	0
40.	Are your relations to girls satisfactory?	133	88	10	7	8	5
41.	Do you easily forget things which trouble you?	78	52	43	28	30	20
42.	Are you apt to be the underdog and get the worst of the deal?	17	11	114	76	20	13
43.	Do you have dizzy spells?	2	1	148	98	1	1
44.	Have you had dizzy spells?	9	6	140	93	1	1
45.	After you retire at night must you get up to make sure the door is closed?	12	8	138	91	1	1
46.	Do any ideas remain constantly in your mind?	87	58	46	31	17	11
47.	Do you check over things carefully?	95	63	23	15	33	22
48.	Do you wash your hands often?	102	68	37	24	12	8
49.	Are you conscientious?	101	68	17	11	32	21
50.	Do you save or collect things?	70	47	74	49	6	4

		YES		NO		DOUBTFUL	
		No.	%	No.	%	No.	%
51.	Are you very precise?	56	38	49	33	43	29
52.	Are you especially neat in your activity?	86	57	28	19	36	24
53.	Do you feel compelled to do any particular thing?	50	33	85	56	16	11
54.	Do you have difficulty making decisions?	25	17	110	73	15	10
55.	Are your spirits fairly constant?	120	79	21	14	10	7
56.	Do you feel gloomy for no apparent reason?	18	12	125	83	7	5
57.	Do you feel depressed?	20	13	122	82	8	5
58.	Do you have periods when you feel up in the clouds?	103	68	38	25	10	7
59.	Have you ever had suicidal ideas?	10	7	137	90	4	3
60.	Do you get angry easily?	17	11	120	80	13	9
61.	Are your feelings easily hurt?	36	24	77	51	38	25
62.	Do you worry about things?	36	24	87	58	28	18
63.	Do you feel tense?	40	27	95	63	16	10
64.	Did you ever have dreams of being chased?	34	23	83	55	3	2
65.	Do you have frightening dreams?	20	13	125	83	6	4
66.	Do you have dreams that awaken you?	25	17	118	78	8	5
67.	Do you have dreams of falling down?	37	25	107	71	6	4
68.	Do you have dreams of being chased?	34	23	114	76	1	1
69.	Did you ever have dreams that came true?	34	23	104	69	12	8
70.	Do you have nightmares?	16	11	129	85	6	4
71.	Do you have dreams in which you are unable to move?	31	21	118	78	2	1
72.	Did you ever have nightmares?	63	42	84	55	4	3
73.	Did you ever have frightening dreams?	64	42	83	55	4	3
74.	Do you day dream frequently?	51	34	75	50	24	16
74A.	How do you feel about this test?						
75.	Are you a finicky eater?	22	15	117	77	12	8

		YES		NO		DOUBTFUL	
		No.	%	No.	%	No.	%
76.	Do you have a temper?	57	33	77	51	16	11
77.	Do you bite your nails?	31	21	118	78	2	1
78.	Are you shy?	50	33	93	65	19	13
79.	Do you have any fears?	27	18	113	75	11	7
80.	Are you disturbed in a crowd?	20	13	126	84	5	3
81.	When you are walking on the street do you feel as though you are going to faint?	0	0	152	100	0	0
82.	Do you fear that you might blush?	31	20	107	71	13	9
83.	Are you afraid of the dark?	6	4	145	96	0	0
84.	Are you afraid of jumping off high places?	27	18	113	75	11	7
85.	Are you afraid of closed rooms?	2	1	148	98	2	1
86.	Do you have odd feelings in elevators?	43	28	104	67	4	3
87.	Are you afraid of animals?	7	5	142	94	1	1
88.	Do you have difficulties at home?	4	3	143	95	3	2
89.	Do you consider yourself a nervous person?	13	9	129	85	9	6
90.	Are you troubled with feelings of inferiority?	21	14	105	69	26	17
91.	Do you lack self-confidence?	14	9	116	77	21	14
91A.	Why do you want to be a pilot?						
92.	Do you feel self-conscious in the presence of a superior?	41	27	82	54	28	19
93.	Do you have difficulty in thinking of the appropriate remark to make in group conversation?	23	15	101	67	27	18
94.	Do you consider yourself a sensitive person?	47	31	82	54	22	15
95.	Do you hold a grudge?	14	9	125	83	12	8
96.	Are you fussy about your appearance?	96	64	33	22	21	14
97.	Do you have much social life?	116	78	17	11	16	11
98.	Do you feel the need for being the center of attention?	9	6	118	79	23	15
99.	Do you get along well with your buddies?	142	95	5	3	3	2
100.	Do you try to avoid arguments?	80	53	49	33	21	14

APPENDIX C

(Supplementary to Section 3, Part I)

Method of recording and scoring Interaction Chronograph data

APPENDIX C

METHOD OF RECORDING AND SCORING INTERACTION CHRONOGRAPH DATA

1. Preparation of Basic Sheets

Rule off and number six or seven sheets of analysis pad paper,[2] using red, green, and ordinary lead pencils, as in Example C. These lines should be drawn over the lines already on the paper. The columns should be headed exactly as in Example C. The following data should be included on the first sheet: subject's name, interviewer's name, date, type of subject, interview number for subject, type of interview. On the succeeding sheets include the interview date and the subject's name.

2 Reading the Tape

The paper tape is "read off" by means of a special scale. Two persons can be used for this process, one to read the figures out loud from the tape, and the other to write down these figures in the appropriate columns.

Two lines on the tape are used. The top blue line represents the interviewer (always referred to as B), and the lower red or purple line represents the subject (always referred to as A).

Four possible classifications may be called aloud: Double Action, Double Silence,[3] A acts, and B acts. The blank spaces between line segments indicate activity, while the colored lines indicate silence.

The tape is placed under the scale and slid from left to right after each number is called aloud. The figure after the decimal point is estimated in tenths of a unit.

For John Miller's tape (Example B) the reader would begin by calling:

B = 2.5
Double silence = .9
A = 2.6
Double silence = .9
B = 2.6
Double action = .3

The writer puts these numbers in the appropriate columns, recording one number on each line, as in Example C. If two numbers are discovered on the same line after the tape is completely read off, the column will have to be

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[2]The paper used for basic sheets is National Analysis Pad, No. 5311, size 25 1/2 x 14".

[3]For definition of the terms "action" and "inaction" see Section 3. In this appendix the term "silence" is used interchangeably with the term "inaction."

[illegible] back to determine which of the two numbers should be first. When the [illegible] the tape have been read off and recorded, the tape is labeled "read" [illegible] filed for future reference.

[illegible]ddition of the Subject's Activity and Inactivity Periods

The next step is the addition of A's total actions and total silences. [illegible]er's totals will be seen in Example D, in the two columns to the [illegible] the four just used (Example C).

[illegible] inactive when there is a number in the columns labeled either "Double Silence" or "B." A is active when there is a number either in Column "A" or in Column "Double Action." Consequently, to total A's periods of inactivity, add all the consecutive numbers in Columns "B" and "Double Silence" until a number in Column "A" or Column "Double Action" indicates that A is no longer silent. Conversely, to total A's actions, add all the consecutive numbers in Column "A" and Column "Double Action" until a number in Column "Double Silence" indicates that A is no longer active.

Each column or each page of the basic sheets is not considered as a separate unit. If A is silent at the bottom of one column and still silent at the top of the next, the total is put on the line with the last value [illegible] silence in the group of figures.

[illegible] Classification of Double Actions and Double Inactions

[illegible] value already recorded in Columns "Double Action" and "Double Silence" [illegible] further classified into one of eight possible categories, as indicated below.

[illegible] indicates that the subject interrupts, but the interviewer continues [illegible] action after the subject ceases the action.

[illegible] indicates that the subject interrupts, and continues the action after [illegible] interviewer stops action.

[illegible] indicates that the interviewer interrupts, and continues the action [illegible] the subject stops action.

[illegible] indicates that the interviewer interrupts, but the subject continues [illegible] after the interviewer stops action.

[illegible] indicates that the subject fails to respond, and the interviewer [illegible] action.

[illegible] indicates that the subject fails to respond, but finally initiates [illegible]

[illegible] indicates that the interviewer fails to respond, but subsequently [illegible] action

[illegible] interviewer fails to respond, and the subject initiates action.

The letters U, V, W, and X have been chosen arbitrarily. U and W respectively indicate that the subject interrupts or fails to respond. V and X respectively indicate that the interviewer interrupts or fails to respond. The bar placed over the letter indicates that the individual has continued action after a double action or has initiated action after a double silence. Thus, the use of the eight categories described above will show in every instance which of the two persons continued to act after a double action, or resumed action after a double silence. (See Example E).

Occasionally a double silence and a double action appear consecutively.

A	Double Action	Double Silence	B	
.3				Count V .4
	.4			Omit 0-0
		.5		Count 0-0
.6				Omit .5

Figure 1-A

A	Double Action	Double Silence	B	
.3				Count X .5
		.5		Omit 0-0
	.4			Count 0-0
.6				Omit .4

Figure 1-B

In the double action followed by the double silence (Figure 1-A) a value of .4 is scored and counted for V, because the interviewer's interruption lasted .4 of a second. Since a double silence followed, one cannot tell whether a bar or a no-bar should be used; hence the bar is omitted. In the case of a double silence (value .5) A initiated the action after the silence, so the value .5 is given a bar. This value cannot be classified as an X or a W because it cannot be determined who was supposed to respond.

In the double silence followed by the double action (Figure 1-B) a value of .5 is scored and counted for X, because the interviewer failed to respond for .5 of a second. Since neither A nor B responded alone, they cannot be given either a bar or a no-bar. The value .4 cannot be counted because neither the subject nor the interviewer interrupted. The bar is counted because A continued the action after a double action.

It can be seen that the numbers and letters form patterns (Figure 2 and Example E). These patterns provide a means of checking the accuracy of [illegible] classification during this whole step.

5. Tabulate Sheets

The preceding steps have all been done on the basic sheets. Now a second set of papers, called [illegible] sheets, are used. The same type of paper is used

Double Double
A Action Silence B

			.5
	.6 V		
			.7

Double Double
A Action Silence B

			.5
		.6	
			.7

			.5
	.6 V		
.7			

			.5
		.6	
.7			

.5			
	.6 V		
			.7

.5			
		.5	
			.7

.5			
	.6 V		
.7			

.5			
		.6	
.7			

FIGURE 2

[illegible] in the basic sheet, [illegible] are [illegible] basic sheets, but are not [illegible]. Each [illegible], as [illegible] a group of four columns is used, [illegible].

6. The Cumulative Addition of A-S

To compute the A-S curve the basic and work-up sheets are used [illegible]. In examples F and F it will be seen by looking at the A-S columns the [illegible]ject's total silences are now subtracted from his total actions. Ea[illegible] is indicated as plus and each inaction is indicated as a minus. The [illegible] is used for the other three curves.

Since John Miller's first value was a silence of 3.4, the first [illegible] in the A-S column on the work-up sheet is -3.4. His first total action [illegible] 2.6. Adding +2.6 to -3.4 gives the next figure of -.8. Subtracting [illegible] silence, -3.5, from -.8, gives -4.3. Every action must be added to th[illegible] immediately preceding it in the A-S column and each silence must be s[illegible] from the preceding figure.

When the last figure of the first column on p. 1 (basic sheet) h[illegible] totalled, draw a line under the last number written on the first work[illegible]. To the left of this line write "End of page 1, column 1," as in Examp[illegible]

Before proceeding, the figures are checked in two ways. For the [illegible] check, the total number of lines used on the first work-up sheet must [illegible] the number of total actions and total silences on p. 1, column 1, of th[illegible] sheets. If the two numbers disagree, some numbers were probably omit[illegible] the cumulative addition, and each number on the first basic page will hav[illegible] be rechecked to find this error.

The second check consists of examining the figures on the first [illegible] sheet to make sure that they were alternately added and subtracted. [illegible] consecutive additions or subtractions are found, an error has been ma[illegible] the column will have to be recalculated.

After these checks are made, the addition is continued. The val[illegible] obtained from each page of the basic sheet are checked, as described [illegible] for the first page.

7. The Cumulative Addition of [illegible], U-W, and Θ-O

After completing the A-S curve, go back to the first pages of th[illegible] and work-up sheets. Just as the A'S were added and S's subtracted, V [illegible] added and X is subtracted, U is added and W is subtracted, Θ (presenc[illegible] bar) is added and O (absence of a bar) is subtracted. Each bar is consid[illegible] as +1, and each no-bar is considered as -1. Place the ruler under th[illegible] total silence in Example E, the value [illegible]. Looking at the four colum[illegible] Double Action, Double Inaction, Θ, there is no V or X, so a zero is p[illegible] the V-X column. There is, however, a W [illegible] .9. Since W's are subtracted [illegible] start this column with a -.9. There is a bar over the W, so +1 is [illegible] the Θ-O column.

Place the ruler beneath the next total action (2.6) in Example E. There are no U's, V's, W's, or X's here, so the previous numbers are repeated, i.e., 0, -.9, +1. Whenever an absence of letters occurs, the preceding numbers are repeated. Moving the ruler down to the next number is Example E and X of .9 will be seen. Because X's are subtracted, a -.9 should be placed in the V-X column on the work-up sheet. Since there is no bar its value is -1, and it cancels the previous +1, giving a zero for the Θ-O column.

The fourth total action is 5.5. The U of +.3 is added to -.9, resulting in -.6. The V of +1.6 is added to -.9, giving +.7. The bar over the U cancels the no-bar over the V, so the status of the Θ-O column remains zero.

For treatment in this step of a possible double silence followed by a double action or inaction, see Figure 1, and its discussion above.

8. Averaging the Work-up Sheets

Every four numbers in columns A-S, V-X, U-W, and Θ-O, must be added and written to the left of the fourth number in each group, as in Example F. These figures are further reduced in value by a factor of 2.5, in order to reduce the scale for placing the values more easily on a graph. This is the same as dividing the sum of each four numbers by 10. The same result for the sum of four numbers is achieved by automatically moving the decimal point one column to the left, for each total of four figures.

Since there are 50 lines in a column on the work-up sheets, the sum of the last four will be written either on the bottom line of any column or two lines above the bottom. Two figures left over at the bottom of any column are added to the first two at the top of the next column, to make the group of four.

The Θ-O curve is added mentally, usually after the other three are finished. Here also the decimal is moved over one column to the left, to divide by 10.

9. Plotting the Graph

Every ten numbers in the work-up sheets are numbered in increments of 10 for plotting them on the graph (Example F).

One large sheet of graph paper[4] is used for each interview. The figures used are those that have just been written as the total of every four numbers on the work-up sheets. Each graph bears the same information as the first basic sheet, such as subject's name, etc.

Before starting the graph, rapidly scan the work-up sheets, to find the highest plus and the lowest minus values. Since there are only 300 lines on

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[4]The graph paper used is made by the Keufel and Esser Company, Engraving No. 334-3, 10 x 10 to the half-inch.

one sheet of graph paper, it may be necessary to glue one sheet above another before being able to construct the abscissa, or the zero line. Draw the abscissa allowing enough space above it for the highest plus value, and sufficient space below it for the lowest minus value.

Place the dots on a graph from left to right, putting one dot for each figure obtained in step 8. This process is illustrated in Example G.

The first curve, A-S, is plotted with an ordinary lead pencil. A red pencil is used for the V-X curve, a blue one for the U-W curve, and a green pencil for the Θ-Ω curve.

Use each tenth number, as indicated at the beginning of step 9. The dot for each number must be placed on a heavy green vertical line of the graph. This is a check to make sure that no values are omitted, repeated, or displaced.

Each curve must be labeled as in Example G.

If the plot represents anything but an ordinary interview on the graph, make a note on vertical pencil lines of any changes or signals given. Signals indicating changes in the type of interview are noted on the ordinates of the plot.

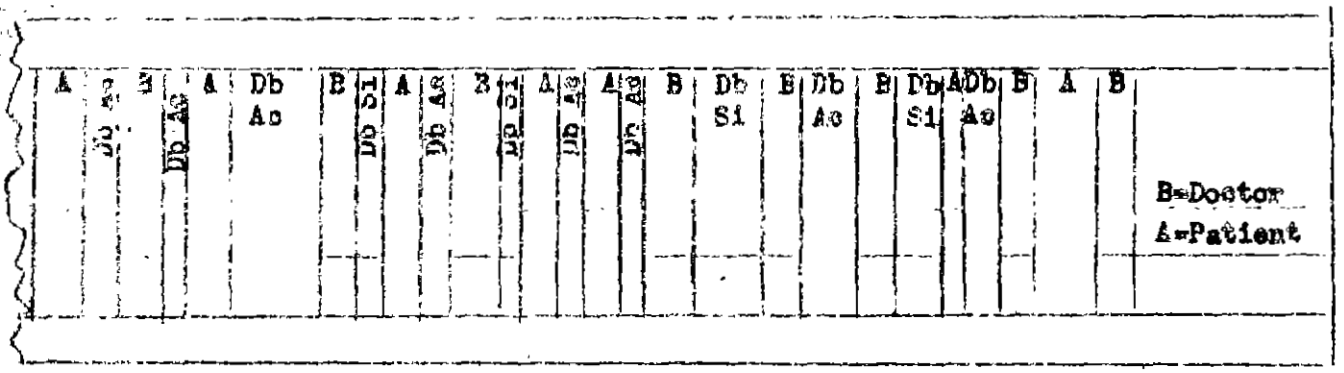
10. Calculation of Mean Speed

Mark off as on Example E with a small double line (//) every group of ten total silences and ten total actions.

Add each twenty numbers as a separate group. Write the numbers on a sheet of yellow paper, as in Example H, labeled "Mean Speed." These numbers are also divided by 10.

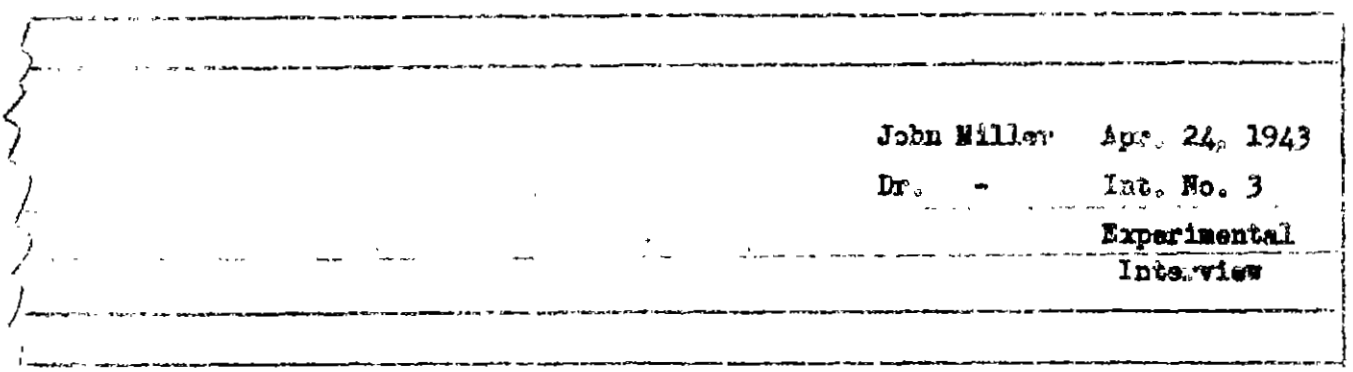
Any special signals noted on the graph are written here, alongside the group of twenty to which they belong.

If the last group of numbers do not add up to an even twenty, note on this sheet the exact number left over.



Read from right to left. (Db Ac = Double Action; Db Si = Double Silence)

EXAMPLE A



EXAMPLE B

EXAMPLE C

John Miller — April 24th, 1943
Interview No. Three — Experimental Interview

A	Double Double Action Silence	B	A	Double Double Action Silence	B
		2.5			1.5
	.9			1.0	
2.6					2.6
	.9			1.4	
		2.6			1.6
	.5			1.1	
3.6			1.7		
	1.6			1.0	
		1.7	2.6		
	1.6			1.2	
1.8			1.8		
	1.5			1.9	
1.6					1.5
	1.5			1.2	
		1.3	2.8		
	1.1			.7	
		1.1			2.3
	1.1			.9	
2.5			3.7		
				1.0	
1.4			3.2		
	1.3			1.1	
		1.0			2.5
	.2			.7	
2.1			3.0		
	.3			3.0	
		1.6			1.6
2.6				1.0	
	1.1		3.5		
		1.5		1.0	
	1.2				1.9
1.9				.6	
	1.2		2.9		
1.1				.9	
	1.4				1.9
		1.0		1.0	
	1.0		1.9		
		1.1		.3	
	1.0				2.0
.9				.5	
	.9		3.6		
1.1				2.3	
	1.4		15.0		
		2.5			7.3
	.2			5.3	
3.6					10.5
		2.5			
	.3				

EXAMPLE D

John M[illegible]

A's Total Action		Double Double Action Silence A		Double Double Action Silence B	A's Total Action	A's Total Silence	Double Double Action Silence A		Double Double Action Silence B
				2.5		4.5			4.5
			.9		1.0		1.0		
2.6		2.6				2.6			2.6
			.9		1.2		1.2		
				2.6					1.6
			.3			2.7		1.1	
		3.6					1.7		
			1.6				1.0		
				1.7			2.6		
			1.6						
		[illegible]					1.3		
			1.5		10.2		1.9		
4.9		1.6							1.5
			1.5			2.7		1.2	
				1.8			2.8		
1.1			1.1		3.5		.7		
				1.1		2.3			2.3
			1.1				.9		
		1.5					3.7		
		1.1					1.0		
4.0		1.4					3.2		
			1.3		9.9		1.1		
				1.0		2.5			2.5
			.2				.7		
		2.1					3.0		
2.2			.1		6.7		3.0		
				1.6					1.6
		2.6				2.6		1.0	
			1.1				3.5		
3.7				1.5	4.5		1.0		
			1.2			1 9			1.9
		1.9					.6		
			1.2				2.9		
4.2		1.1			4.4		.9		
			1.4			1.9			1.9
				1.0			1.0		
1.0			1.0				1.9		
				1.1	3.7		.8		
			1.0			2.0			2.0
							.5		
			.9		1.1		3.6		
2.9		1.3				8.3		8.3	
			1.4		13.0		15.0		
				2.5					7.3
			.2					52.3	
3.8		3.6				70.1			10.5
				2.5					
			8						
		3.7							
4.0			.3						

EXAMPLE E

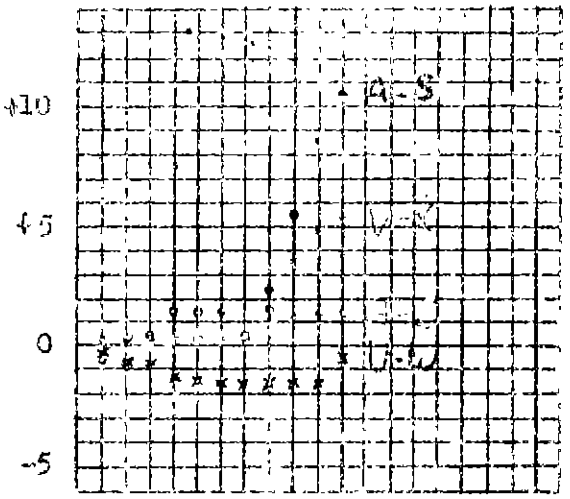
John

Total Action Silence A		Double Action Silence A		Total Action Silence A		Double Action Silence A		Double Action Silence B
			2.5		3.5			4.5
				1.0		1.0		
2.5	2.6				2.6			2.6
				3.2		1.2		
			2.6					1.6
					2.7		1.1	
	3.6				1.7			
5.5						1.9		
			1.7		2.6			
						1.2		
	1.8				1.8			
				10.2		1.3		
4.9	1.6							1.5
					2.7		1.2	
			1.8		2.8			
1.1						.7		
					2.3			2.3
						.9		
					3.7			
						1.0		
4.0	1.4				3.2			
				3.9		1.1		
					2.5			2.5
						.7		
	2.3				3.0			
2.2				6.7		3.0		
								1.6
	2.5				2.6		1.0	
3.7					3.5			
				4.5		1.0		
			1.2		1.9			1.9
						.6		
					2.9			
4.2				4.4		9		
					1.9			1.9
						1.0		
1.3					1.9			
				3.7		.8		
			1.0		2.0			2.0
						.5		
				4.1	3.6			
					8.3		8.3	
			1.4	15.0	15.0			
								7.3
							52.3	
					70.2			10.5

EXAMPLE F

John Miller

	L.S		V.Y		D.M.		A.D	
		-3.4		0		-.9		+1.
		-.8		0		-.9		+1.
		-4.3		-.9		-.9		0
	-.7	+1.2	0	+.7	-.3	-.6	+.2	0
		-2.1		+.7		-2.2		+1.
		+2.8		+2.2		-2.2		+2.
		-.5		+.7		-2.2		+1
	+.1	+.6	+.4	+.7	-.8	-1.1	+.4	0.
		-1.6		+.7		-2.2		+1
		+2.4		+1.8		-2.2		+2
		-.1		+.5		-2.4		+2
	+.3	+2.1	+.4	+.6	-.9	-2.4	+.6	+1
		+.5		+.6		-2.4		+1
		+4.2		+1.7		-2.4		0
		+1.5		+1.7		-3.6		+1.
	+1.2	+5.7	+.7	+2.9	-1.2	-3.6	+.4	+2.
		+3.3		+1.5		-3.6		+1.
		+4.3		+1.5		-2.6		0
		+2.2		+1.5		-3.6		+1
	+1.5	+5.1	+.7	+2.4	-1.3	-3.6	+.4	+2
		+1.2		+1.0		-3.6		+1
		+5.0		+1.0		-3.4		+2
		+1.7		+1.0		-4.2		+3
End of	+1.4	+5.7	+.4	+1.3	-1.5	-4.2	+.8	+2
		+1.2		+1.3		-4.2		+2
		+2.2		+1.3		-3.2		+1
		-.4		+1.3		-3.2		+1.
	+.4	+.8	+.5	+1.3	-1.3	-2.0	+.4	0
		-1.9		+1.3		-3.1		+1
		+8.3		+5.4		-3.1		+2
		+5.6		+5.4		-4.3		+3
	+2.1	+9.1	+1.8	+6.1	-1.5	-4.3	+.8	+2
		+6.8		+6.1		-4.3		+2
		+10.7		+8.2		-3.4		+3
		+14.2		+8.2		-3.4		+3
	+5.7	+20.9	+3.4	+11.2	-1.4	-2.7	+1.1	+3
		+13.3		+11.2		-3.7		+4
		+22.8		+12.2		-3.7		+3
		+20.9		+12.2		-3.7		+3
	+8.7	+25.3	-4.9	+13.1	-1.4	-3.1	+1.3	+3
		+23.4		+13.1		-3.1		+3
		+27.1		+13.9		-2.1		+3
		+25.1		+13.9		-2.1		+3
	+10.5	+29.2	+5.5	+13.9	-.9	-1.6	+1.3	+4
		+20.9		+5.6		-1.6		+5
		+35.9		+5.6		-1.6		+5
		-34.8		+5.6		-53.9		+4



EXAMPLE G

ILLUSTRATIVE GRAPH OF FIRST ELEVEN POINTS (Enlarged)

EXAMPLE H

MEAN SPEED

John Miller April 2[illegible], 1943 Dr. -- Int. [illegible]

[illegible].91

7.82

(7 numbers left over)

APPENDIX 7

(Supplementary to Section 3 of 4)

Mathematical analysis of method of combining scores in the Cobb-Flanagan Squantum study on the selection of aircraft pilots. Prepared by Leon Festinger in the Statistical Office of the Committee on Selection and Training of Aircraft Pilots, University of Rochester.

MATHEMATICAL ANALYSIS OF METHOD OF COMBINING SCORES IN THE COBB-FINESINGER QUANTUM STUDY ON THE SELECTION OF AIRCRAFT PILOTS[5]

The object of the following analysis is to determine a method for obtaining the maximum difference between means of two groups, where the scores are measured from the x axis rotated to any desired angle.

We may begin by determining the score of a point on a coordinate axis (Point x_1 y_1) when the new score is the perpendicular distance from this point to the x axis rotated θ degrees from its original position. Thus, in Figure 1, when the distance from the point x_1 y_1 is measured perpendicular to the rotated axis x', s_1 is the new score.

It is obvious that as far as relative position between points goes, it makes no difference what the y intercept of the reference line is. We can therefore always regard this y intercept as zero and deal only with the angle of rotation of the x axis.

As shown, under Figure 1, we may readily obtain the equation for s in terms of x, y, and θ for any particular point. These are Equations 1, 1a, 1b, etc., in the derivation. We thus now have a mathematical expression for giving us the new score without actually performing the rotation and measurement.

We may also derive expressions for the means of any particular group, for example, passers and failers, in terms of the new scores. These are given in Equations 3a and 3b.

It remains only for us to determine mathematically what rotation of the x axis will give a maximum difference between the means of the passers and the means of the failers. This can be obtained by differentiating Equation 4 with respect to θ and setting the derivative equal to zero. Performing this, we arrive at Equation 7, which gives us the value of θ for which the difference between the means of passers and failers is at a maximum.

Thus by purely mathematical manipulation, without actually drawing graphs or measuring distances, we may find the best possible new reference line and also calculate the bi-serial calculation. The standard deviation of the distribution of new scores is given by Equation 13.

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[5]Prepared by Leon Festinger in the Statistical Office of the Committee on Selection and Training of Aircraft Pilots, University of Rochester.

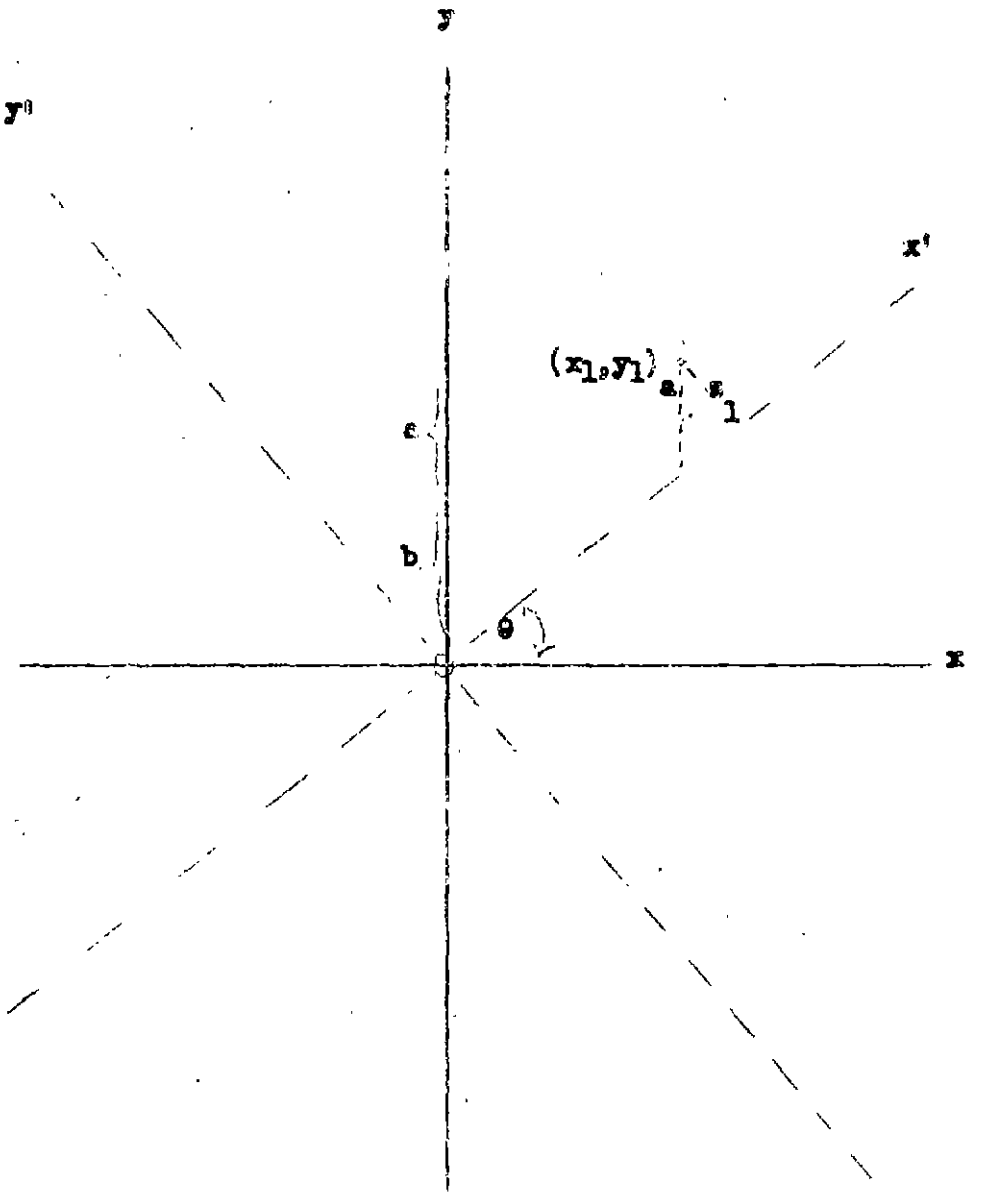

FIGURE 1

$x_1 = a \cos \theta$

$b = x_1 \tan \theta$

$a = y_1 - x_1 \tan \theta$

$s_1 = y_1 \cos \theta - x_1 \cos \theta \tan \theta$

$s_1 = y_1 \cos \theta - x_1 \sin \theta$

DERIVATION

(1) $z_1 = y_1 \cos\theta - x_1 \sin\theta$, similarly

(1a) $z_2 = y_2 \cos\theta - x_2 \sin\theta$, and

(1b) $z_3 = y_3 \cos\theta - x_3 \sin\theta$, and

.
.
.

(1c) $z_n = y_n \cos\theta - x_n \sin\theta$

Summing separately for passers and failers, we have:

(2a) $\Sigma z_p = \cos\theta \Sigma y_p - \sin\theta \Sigma x_p$, and

(2b) $\Sigma z_f = \cos\theta \Sigma y_f - \sin\theta \Sigma x_f$

Dividing through by the appropriate N, we have:

(3a) $\bar{z}_p = \cos\theta \bar{y}_p - \sin\theta \bar{x}_p$, and

(3b) $\bar{z}_f = \cos\theta \bar{y}_f - \sin\theta \bar{x}_f$

These equations give us a method of calculating the mean of the new scores. It but remains to determine the value of θ at which $(\bar{z}_p - \bar{z}_f)$ is a maximum.

(4) $\bar{z}_p - \bar{z}_f = \cos\theta \ (\bar{y}_p - \bar{y}_f) - \sin\theta \ (\bar{x}_p - \bar{x}_f)$

(5) $\dfrac{d\ (\bar{z}_p - \bar{z}_f)}{d\theta} = -\sin\theta \ (\bar{y}_p - \bar{y}_f) - \cos\theta \ (\bar{x}_p - \bar{x}_f) = 0$

(6) $\dfrac{\sin\theta}{\cos\theta} = -\dfrac{(\bar{x}_p - \bar{x}_f)}{(\bar{y}_p - \bar{y}_f)}$

(7) $\tan\theta = -\dfrac{(\bar{x}_p - \bar{x}_f)}{(\bar{y}_p - \bar{y}_f)}$ at which θ, $(\bar{z}_p - \bar{z}_f)$ is at a maximum.

To find σ_z we have the following:

(8) $z_i - \bar{z} = y_i \cos\theta - x_i \sin\theta - \bar{y} \cos\theta + \bar{x} \sin\theta$

(9) $(z_i - \bar{z})^2 = [\cos\theta \ (y_i - \bar{y}) - \sin\theta \ (x_i - \bar{x})]^2$

(10) $(z_i - \bar{z})^2 = (y_i - \bar{y})^2 (\cos\theta)^2 + (x_i - \bar{x})^2 (\sin\theta)^2$

$- 2(y_i - \bar{y}) (x_i - \bar{x}) \sin\theta \cos\theta$

Summing for all cases, we have:

$$(11) \quad \sigma(s_i - \bar{s})^2 = (\cos\theta)^2 \Sigma(y_i - \bar{y})^2 + (\sin\theta)^2 \Sigma(x_i - \bar{x})^2 - 2 \sin\theta \cos\theta \Sigma(y_i - \bar{y})(x_i - \bar{x})$$

Dividing through by N, we have:

$$(12) \quad \sigma_s^2 = (\cos\theta)^2 \sigma_y^2 + (\sin\theta)^2 \sigma_x^2 - 2 \sin\theta \cos\theta r_{xy} \sigma_x \sigma_y$$

$$(12m) \quad \sigma_s = \sqrt{(\cos\theta)^2 \sigma_y^2 + (\sin\theta)^2 \sigma_x^2 - 2 \sin\theta \cos\theta r_{xy} \sigma_y}$$

EXAMPLE OF COMPUTATION FOR CONFIRMATION OF CORRECTED PENTAGON AND 5 POINTS OFF UPPER LINE[6]

$\bar{x}_p = 0.166$ $\quad \bar{x}_f = 26.829$ $\quad n_p = 112$

$\bar{y}_p = 17.071$ $\quad \bar{y}_f = 20.629$ $\quad n_f = 35$

$$(\bar{x}_p - \bar{x}_f) = -26.663$$

$$(\bar{y}_p - \bar{y}_f) = -3.558$$

$$\tan \theta = -\frac{(\bar{x}_p - \bar{x}_f)}{\bar{y}_p - \bar{y}_f} = 7.498$$

$\theta = 115°$; $\cos \theta = -.43025$; $\sin \theta = .90271$

$\bar{s}_p = .43025 \times 17.071 - .90271 \times 19.366 = 24.827$

$\bar{s}_f = .43025 \times 20.629 - .90271 \times 25.829 = 32.095$

$\sigma^2_z = .1851 \times 42.51 + .8149 \times 91.02 - 2 (-.3884) (.293) (62.201)$

$\sigma^2_z = 96.108$; $\sigma_z = 9.82$

$$r_{bis} = \frac{8.263}{9.81} \times \frac{.1816}{.3061} = .50$$

This biserial is based upon the greatest possible difference between the means of passers and failers obtainable by this method of combination.

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[6]Units changed so that smallest score = 0.

APPENDIX E

(Supplementary to Section 5)

Work Sheet for Autonomic Tests.

TABLE X

WORK SHEET FOR AUTONOMIC TESTS

Name Date

Status Time Temp. Hum.

Resistance	Palm	Wrist
Seated		
Stand		
"		
Strain		
Stand		
"		

Reclining

B.P.	Palm	Wrist

Skin Temperature

Palm	Forearm	Forehead

R.Per.	MPD	H.Per.	MPD	Pause

Remarks

Dermographia

	Raw	Tentative Rating
Salivation		
Total		
Supernatant		
Precipitate		
Dermographia		
Latency		
Persistence		
Conductance		
Stand Palm		
Recline Palm		
Log Dif.		
Wrist		
Blood Pressure		
Systolic		
Diastolic		
Pulse		
Heart		
Mean Period		
Mean Period Dif.		
Respiration		
Mean Period		
Mean Period Dif.		
Mean Pause		
Skin Temperature		
Palm		
Forearm		
Palm-Head Dif.		
Arm-Head Dif.		

Auto[illegible]ic Bal

APPENDIX F

(Supplementary to Section 6)

Progression and cumulative tables for EEG measures which did not show biserials of at least .20 or chi-squared P-values over .05.

TABLE F-1

THE NUMBER OF FREQUENCIES PRESENT FOR AT LEAST 10% OF THE TIME

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Total Group
Values	Zero	1	2 or more	
Passers (N)	64	27	24	115
% of Passers	56%	23%	21%	100%
Failers (N)	24	5	6	35
% of Failers	69%	14%	17%	100%
Total (N)	88	32	30	150
% of Total	59%	21%	20%	100%
Pass-Fail Ratio	2.7	5.4	4.0	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-2

THE NUMBER OF FREQUENCIES PRESENT FOR AT LEAST 10% OF THE TIME

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
2 or more	115	100%	35	100%	150	100%
1	91	79%	29	83%	120	80%
Zero	64	56%	24	69%	88	59%

Biserial r = .12

Chi calculated for 2 cells (Under 1; 1 or over): P = .20

When 3 cadets who failed in ground school are omitted from the series, biserial r = .16

TABLE F-3

DOMINANT FREQUENCY: NUMBER OF CYCLES PER SECOND BY WHICH IT IS REMOVED FROM 10.0

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Total Group
Values	0 - 0.5	1.0 - 7.5	8.0 & over	
Passers (N)	75	36	4	115
% of Passers	65%	31%	3%	100%
Failers (N)	17	15	3	35
% of Failers	49%	43%	9%	100%
Total (N)	92	51	7	150
% of Total	61%	34%	5%	100%
Pass-Fail Ratio	4.4	2.4	1.3	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-4

DOMINANT FREQUENCY: NUMBER OF CYCLES PER SECOND BY WHICH IT IS REMOVED FROM 10.0

(Cumulative Table: Per cent of Passers and Failers at and above each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
0	115	100%	35	100%	150	100%
1.0	40	35%	18	51%	58	39%
8.0	4	3%	3	9%	7	5%

Biserial r = .11

Chi^2 calculated for 2 cells (0 to 0.5; over 0.5): P = .10

TABLE F-5

PER CENT TIME GROSS ALPHA (8.0 to 13.0 CYCLES)

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Group 4	Total Group
Values	Under 30%	30 - 49.9%	50 - 69.9%	70% & over	
Passers (N)	14	29	53	19	115
% of Passers	12%	25%	46%	17%	100%
Failers (N)	8	9	15	3	35
% of Failers	23%	26%	43%	9%	100%
Total (N)	22	38	68	22	150
% of Total	15%	25%	45%	15%	100%
Pass-Fail Ratio	1.8	3.2	3.5	6.3	(3.[illegible]

*Note that the percentages for failers are based on only 35 cases.

TABLE F-6

PER CENT TIME GROSS ALPHA (8.0 to 13.0 CYCLES)

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
70% & over	115	100%	35	100%	150	100%
69.9%	96	83%	32	91%	128	85%
49.9%	43	37%	17	49%	60	40%
29.9%	14	12%	8	23%	22	15%

Biserial r = .15

Chi^2 calculated for 2 cells (Under 50%; 50% and over): P = .15

TABLE F-7

PER CENT TIME REGULAR ALPHA (8.0 to 13.0 CYCLES OCCURING IN CHAINS OF AT LEAST 3 WAVES TOGETHER OF THE SAME FREQUENCY)

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Total Group
Values	Under 20%	20 - 39%	40% & Over	
Passers (N)	24	72	19	115
% of Passers	21%	63%	17%	100%
Failers (N)	13	19	3	35
% of Failers	37%	54%	9%	100%
Total (N)	37	91	22	150
% of Total	25%	61%	15%	100%
Pass-Fail Ratio	1.8	3.8	6.3	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-8

PER CENT TIME REGULAR ALPHA (8.0 to 13.0 CYCLES OCCURRING IN CHAINS OF AT LEAST 3 WAVES TOGETHER OF THE SAME FREQUENCY)

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
40% & over	115	100%	35	100%	150	100%
39%	96	83%	32	91%	128	85%
19%	24	21%	13	37%	37	25%

Biserial r = .15

Chi^2 calculated for 3 cells (Under 20%; 20% - 39%; 40% and over): P = .15

TABLE F-9

PER CENT TIME REGULAR ALPHA, DIVIDED BY
PER CENT TIME GROSS ALPHA

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Total Group
Values	Under .50	.50 - .59	.60 & above	
Passers (N)	37	45	33	115
% of Passers	32%	39%	29%	100%
Failers (N)	14	15	6	35
% of Failers	40%	43%	17%	100%
Total (N)	51	60	39	150
% of Total	34%	40%	26%	100%
Pass-Fail Ratio	2.6	3.0	5.5	3.3

*Note that the percentages for failers are based on only 35 cases.

TABLE F-10

PER CENT TIME REGULAR ALPHA, DIVIDED BY
PER CENT TIME GROSS ALPHA

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
.60 and above	115	100%	35	100%	150	100%
.59	82	71%	29	83%	111	74%
.49	37	32%	14	40%	51	34%

Biserial r = .09

Chi^2 calculated for 2 cells (Under .60; .60 or over): P = .20

TABLE F-11

NUMBER OF FREQUENCIES PRESENT FOR AT LEAST 5% OF THE TIME

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Total Group
Values	Under 3	3	4 or over	
Passers (N)	57	44	14	115
% of Passers	50%	38%	12%	100%
Failers (N)	23	11	1	35
% of Failers	66%	31%	3%	100%
Total (N)	80	55	15	150
% of Total	53%	37%	10%	100%
Pass-Fail Ratio	2.5	4.0	14.0	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-12

NUMBER OF FREQUENCIES PRESENT FOR AT LEAST 5% OF THE TIME

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
4 and over	115	100%	35	100%	150	100%
3	101	88%	34	97%	135	90%
2	57	50%	23	66%	80	53%

Biserial r = .19

Chi^2 calculated for 3 cells (Under 3; 3; 4 and over): P = .15

When 3 cadets who failed ground school are omitted from the series, biserial r = .21

TABLE F-13

PER CENT TIME DOMINANT FREQUENCY

(Progression Table: Per Cent of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Total Group
Values	Under 5%	5 - 14.9%	15% & over	
Passers (N)	20	81	14	115
% of Passers	17%	70%	12%	100%
Failers (N)	9	23	3	35
% of Failers	26%	66%	9%	100%
Total (N)	29	104	17	150
% of Total	19%	69%	11%	100%
Pass-Fail Ratio	2.2	3.5	4.7	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-14

PER CENT TIME DOMINANT FREQUENCY

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
15% and over	115	100%	35	100%	150	100%
14.9%	101	88%	32	91%	133	89%
4.9%	20	17%	9	26%	29	19%

Biserial r = .17

Chi^2 calculated for 2 cells (Under 10; 10 and over): P = .20

When 3 cadets who failed ground school are omitted from the series, biserial r = .18

TABLE F-15

THE TOTAL AMOUNT OF REGULAR ALPHA IN THOSE FREQUENCIES WHICH ARE PRESENT FOR AT LEAST 10% OF THE TIME

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Group 4	Total Group
Values	0 - 9.9%	10 - 19.9%	20 - 29.9%	30% & over	
Passers (N)	64	26	18	7	115
% of Passers	56%	23%	16%	6%	100%
Failers (N)	24	7	3	1	35
% of Failers	69%	20%	9%	3%	100%
Total (N)	88	33	21	8	150
% of Total	59%	22%	14%	5%	100%
Pass-Fail Ratio	2.7	3.7	6.0	7.0	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-16

THE TOTAL AMOUNT OF REGULAR ALPHA IN THOSE FREQUENCIES WHICH ARE PRESENT FOR AT LEAST 10% OF THE TIME

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
30% and over	115	100%	35	100%	150	100%
29.9%	108	94%	34	97%	142	95%
19.9%	90	78%	31	89%	121	81%
9.9%	64	56%	24	69%	88	59%

Biserial r = .17

Chi^2 calculated for 2 cells (Under 20%; 20% and over): P = .20

When 3 cadets who failed ground school are omitted from the series, biserial r = .20

TABLE F-17

TOTAL PER CENT TIME REGULAR ALPHA IN THOSE FREQUENCIES WHICH PRESENT FOR AT LEAST 10% OF THE TIME MULTIPLIED BY THE NUMBER FREQUENCIES WHICH COMPOSE IT

(Progression Tables: Per Cent of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Groups	Group 1	Group 2	Group 3	Group 4	[illegible]
Values	0 - 9.9	10 - 19.9	20 - 29.9	30.0 or [illegible]	
Passers (N) % of Passers	82 56%	17 15%	16 14%	18 16%	13 100%
Failers (N) % of Failers	24 69%	5 14%	3 9%	3 9%	35 100%
Total (N) % of Total	88 59	22 15%	19 13%	21 14%	150 100%
Pass-Fail Ratio	3.7	3.4	5.3	6.0	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-18

TOTAL PER CENT TIME REGULAR ALPHA IN THOSE FREQUENCIES WHICH ARE PRESENT FOR AT LEAST 10% OF THE TIME MULTIPLIED BY THE NUMBER OF FREQUENCIES WHICH COMPOSE IT

(Cumulative Tables: Per cent of Passers and Failers at and below each Value Indicated)

Score Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
60 and over	118	100%	35	100%	150	100%
50.9	97	84%	32	91%	129	86%
29.9	81	70%	29	83%	110	73%
9.9	64	56%	24	69%	88	59%

Biserial r = .13

Chi^2 calculated for 2 cells (Under 30%; 30% and over): P = .15

When 3 cadets who failed ground school are omitted from the series, the serial r = .17

TABLE F-19

TOTAL PER CENT TIMES REGULAR ALPHA DIVIDED BY
THE NUMBER OF FREQUENCIES PRESENT FOR AT LEAST 10% OF THE TIME

(Progression Table: Per Cent* of Passers and Failers and Pass-Fail Ratios in Successive Groups)

Scores	Group 1	Group 2	Group 3	Total Group
Values	0 - 9.9	10.0 - 29.9	30.0 & over	
Passers (N)	64	26	25	115
% of Passers	56%	23%	22%	100%
Failers (N)	24	6	5	35
% of Failers	69%	17%	14%	100%
Total (N)	88	32	30	150
% of Total	59%	21%	20%	100%
Pass-Fail Ratio	2.7	4.3	5.0	(3.3)

*Note that the percentages for failers are based on only 35 cases.

TABLE F-20

TOTAL PER CENT TIME REGULAR ALPHA DIVIDED BY
THE NUMBER OF FREQUENCIES PRESENT FOR AT LEAST 10% OF THE TIME

(Cumulative Table: Per cent of Passers and Failers at and below each Value Indicated)

Scores Value	N_p	$\%_p$	N_f	$\%_f$	N_t	$\%_t$
30.0 and over	115	100%	35	100%	150	100%
29.9	90	78%	30	86%	120	80%
9.9	64	56%	24	69%	88	58%

Biserial r = .16

Chi^2 calculated for 2 cells (Zero; 1 or more): P = .15

When 3 cadets who failed ground school are omitted from the series, biserial r = .20

APPENDIX C

(Supplementary to Section 7)

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APPENDIX C-1

RORSCHACH TEST DATA ON FIRST ONE HUNDRED CASES

Items	Mean	Standard Deviation	Coefficient of Variation
R	19.1	6.9	36
M%	43.0	22.3	52
F%	68.8	16.4	24
F+%	82.9	13.6	39
F-%	17.3	15.6	90
M sum	0.76	1.0	130
C sum	2.15	1.8	84
Y sum	1.30	1.2	85
B%	13.9	14.3	103
A%	50.1	15.8	32
P%	19.9	11.9	60
Z%	7.9	11.9	150
Rejections	0.39	0.9	230
FC	0.96	1.0	104
CF	0.81	1.0	123
C	0.32	0.6	187
S	0.98	1.0	102
O+	0.07	0.3	430
MF	0.49	0.7	143
FM	0.13	0.3	271

APPENDIX C-2

RORSCHACH SCORE SHEET, ESTABLISHED ON BASIS OF FIRST HUNDRED CASES

Name: Date:

Items	Data	Standard Scores 1	2	3	4	5
		.5	.5	.5	.5	
R		-8	9-15	16-23	24-31	32-
W%		-10	11-31	32-54	55-77	78-
D%		-44	45-60	61-77	78-93	94-
F+%		-58	59-74	75-91	.92-	
F-%		.8		9-25	26-41	42-
M sum			0	0.1-1.5	1.6-2.5	2.6-
C sum		0	0.1-1.0	1.1-3	3.1-5	5.1-
Y sum		0	0.1-0.9	1.0-2.0	2.1-3	3.1-
m%		0	1-6	7-21	22-35	36-
A%		-25	26-41	42-58	59-74	75-
P%		0-13		14-26	27-38	39-
Z%		0-2		3-14	15-26	27-
[illegible]		2-	1		0	
FC			0	1	2	3-
CF			0	1	2	3-
C			0		1	2-
S			0	1	2	3-
C-			0			1-
M-			0		1	2-
FC			0			1-

APPENDIX G-3

TITLES AND SOURCES OF PICTURES USED IN THE THEMATIC PICTURE TEST AND FIVE-WORD TEST

(Arranged in order of presentation)

1. "Fairy Tales" by A. Schnikin. Metropolitan Museum of Art
2. "Toast," Saturday Evening Post, January 11, 1941.
3. "Bus Passengers" by I. Soyer. Metropolitan Museum of Art
4. "Masters" by T. Lea. Life, January 27, 1941.
5. "Juliet" by Fletcher Martin. Metropolitan Museum of Art.
6. "Thanksgiving." Life, November 18, 1940.
7. "Man Standing" by J. S. Sargent. Metropolitan Museum of Art
8. "Lilit" by F. Tamboe. Metropolitan Museum of Art.
9. "Adrift" by E. Biggins. Metropolitan Museum of Art.
10. "The Barber" by F. E. Harper. Metropolitan Museum of Art.

APPENDIX C-4

ANSWER SHEET FOR FIVE-WORD TEST

Subject's Name _____ Date _____

Subject's number _____

Special Identification _____

No.	First Word	Second Word	Third Word	Fourth Word	Fifth Word
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

APPENDIX G-5

DICTIONARY USED IN "FIVE-WORD TEST, SCORING METHOD 2

Personal References

The nominative singular, nominative plural and possessive singular and forms of nouns and pronouns should be counted.

---

acquaintance
amateur
artist
Athlete

Babbitt
baby
banker
boss
boxer
boy

captain
character
child
Cinderella
citizen
clubman
commander
comrade
Conrad
convict
cosmopolite
couple
crowd

Dad
dancer
daughter
diver
dreamer

each
employer
everyone

farmer
father
fellow
fisherman
folks
friend

gentleman
girl
Grandma
group
guest
gymnast

he
helpmate
her
hers
herself
him
himself
his
host
husband

Jim
Johnson

King

laborer
lady
landowner
lover

male
man
Marie
master
me
militia
mine
miss
model
mother
Mrs. T.
my
myself

nude

officer
our
ours
ourself
ourselves
outcast

painter
pal
passenger
peasant
peon
people
pioneer
plowman
prostitute
pseudo-traveler

relative

sailor
Samurai
seaman
she
shipmate
shopgirl
shopper
sister
slave
soldier
someone
son
spectator
student
survivor
Swede

their
theirs
them
they
tumbler

us

we
wife
woman
worker
workingman
workman

you
your
yours
yourself

ABSTRACTIONS

The nominative plural and possessive singular and plural forms of nouns should be counted; as well as the nominative singular forms.

---

ability
acceptance
accomplishment
achievement
action
admiration
adolescence
adventure
advice
affair
affection
age
agony
agreeability
agreement
aloofness
ambition
Americanism
anguish
anniversary
anticipation
anxiety
apathy
appeal
appetite
apprehension
aridity
arrival
art
artistry
attempt
attention
attraction
award
awe
awkwardness

balance
bareness
barrenness
beauty
bestiality
bewilderment
birth
bleakness
boast
boredom

brawn
brightness
brotherhood
brutishness
build

calm
"camaraderie"
celebration
century
character
cheer
cheerfulness
childhood
class(es)
cleanliness
climax
closeness
coarseness
cold
coldness
comfort
companionship
comparison
compassion
complacency
composition
composure
comradeship
conceit
concentration
conception
concern
cordiality
conditions
condolence
confidence
conglomeration
congratulation
consolation
"consolance"
content
contentment
contrast
control
conversation
conviviality

coolness
cooperation
coordination
courage
"crowdiness"
culture

death
defeat
dejection
delineation
demonstration
dependence
depredation
depression
desire
desolation
despair
destitution
determination
detail
development
devotion
disappointment
disaster
discipline
disgust
disinterest
disproportion
dissipation
distress
diversion
domesticity
doubt
dream
dreamland
dreariness
drudgery
dryness
dullness
duty

[illegible]erness
ease
education

effort
ego
elation
enmity
emotion (s)
emptiness
encouragement
endeavor
endurance
enjoyment
enthusiasm
envy
escape
excitement
exercise
exertion
exhaustion
existence
expectation
experience
expression

failure
faith
family
famine
farewell
fatigue
fear
feeling
felicity
fellowship
foolishness
force
foresight
forlornness
fortitude
fraternity
freedom
friendliness
friendship
frustration
fun
futility
future

gaiety
gemütlichkeit
gentility
glee
glory
God
goodbye
goodfellowship
gossip
grace
grayness
grief
grimmness
grit
guidance

happiness
hardiness
hardness
hardship
health
heartiness
help
helpfulness
home
homelife
homesickness
hominess
honor
hope
hopefulness
hopelessness
hospitality
humanity
humor
hunger
hurt

ideals
ignorance
illness
incredibility
indifference
indulgence

jest
job
jollity
joviality
joy

knowledge

labor
lack
leadership
liberty
life
loneliness
look
loss
love
loyalty
lunacy

masculinity
maternity
maturity
meditation
meeting
melancholy
memory
mercy
mentality
middle-age
mind
mirth
misery
mistake
mode
monotony
mood
motherhood
motherliness
motherlove

monotonousness
nothingness
nudity

occasion
old-age
optimism
outlet
orderliness
over-indulgence

pain
passion
passiveness
past
pathos
patience
peace
peacefulness
penance
pensiveness
pep
period
pessimism
plainness
plans
pleasantness

ABSTRACTIONS

rage
realism
reality
realization
recognition
reconciliation
regret
relation
relaxation
relentlessness
religion
reminiscence
rendezvous
repose
resignation
resignedness
respect
rest
retirement
return
reunion
reverie
riches
romance
rush
ruthlessness

sadness
satisfaction
scene
seamanship
section
security
self-concern
sensitivity
serenity
servitude
sex
shame
show
sickness
silence
simplicity
sincerity
skill
slumber
sleep
softness
solitude
sorrow
specimen
spirit
spite
sport
sportsmanship
stamina
starvation
stillness
stolidity
strain
strength
strife
struggle
study
sturdiness
success
surprise
suspicion
sweetness
sympathy

talent
task
taste
teamwork
tenderness
tenseness
tension
terror
thankfulness
thanks
thirst
thought
thoughtfulness
time
timidity
tiredness
toast
toil
torture
tragedy
trouble
twenties
type

"unbalance"
"uncomfort"
understanding
unhappiness
unity

value
variety
vastness
vengeance
victory
view
virtue

wages
wanderlust
warmth
waste
weakness
wealth
weariness
well-being
well-wishes
willingness
winning
wisdom
"wishfullness"
wistfullness
woe
womanhood
wonder
wonderment
work
worry
wrath
wrongdoings

youth

zest

APPENDIX

Descriptive Adjectives

abject
abstract
accurate
adolescent
adrift
aesthetic
aflout
ageless
alcoholic
alone
ambitionless
ambitious
American
angry
anxious
apathetic
arid
aristocratic
artificial
artistic
ashy
asses
asleep
athletic
attentive
authentic
average
awkward

backward
bad
bare
barren
beaten
beautiful
bedraggled
better
black
bleak
blond
bodily
Bohemian
boorish
bored
bossed
bourgeois

boyish
brawny
broken
brute
buffeted
burnt
busy

calm
carefree
careworn
caught
cheerful
citified
civilized
clad
classic
clean
clear
clenched
close
coarse
cold
colorful
comfortable
commercial
common
competitive
complete
cool
cooperative
confident
content
criminal
crowded
crude
curious
cynical

damp
dark
dated
deep
dejected

delicious
depressed
desolate
despondent
determined
developed
difficult
dirty
disappointed
discontented
discouraged
disinterested
dismal
dispirited
dissatisfied
distasteful
divine
domestic
domesticated
drab
dreamy
dreary
Dresden
dressed
drunk
dull
dumb
dusty

eager
early
earthly
elderly
energetic
eventful
everyday
evil
exaggerated
excellent
even
exhausted
exotic
expectant
exposed

fair
faithful
fake
false
far-away
fat
festive
fine
finished
firm
flat
foodless
forced
foreign
forlorn
forsaken
frail
French
friendly
full
full-dress
funny
futile
future

gay
gentle
German
gloomy
gnarled
gone
good
graphic
great
Grecian
grim
grotesque

Descriptive Adjectives

haggard
half
happy
hard
healthy
hearty
heavy
hectic
high
homelike
homey
honored
hopeful
hopeless
hot
human
humble
hundrum
hungry
husband's

idle
ill-balanced
imaginative
important
impossible
impractical
impressionistic
Indian
indifferent
inferior
insecure
intense
intimate
intoxicated
irregular

Japanese
Johnson's
jolly
jovial
joyful
joyous
jubilant

kind

land's
large
last
late
lifelike
life's
light
little
lonely
lonesome
long
lost
lovely
lower
lush

male
manly
man's
married
masculine
massive
maternal
mediocre
melancholy
mental
merry
mid-western
military
mixed
Mongolian
moody
morbid
morose
motionless
motley
motherly
mother's
muscular
mutual

naked
nautical
neat
next
nice
nineteenth
no
noisy
Norse
not
nourished
nude

obstinate
old
olden
olderly
one
open
ordinary
overcast
overstuffed
overworked
Oriental

pale
Parisian
passing
paternal
pathetic
peaceful
peculiar
pensive
perfect
phlegmatic
physical
picturesque
plain
pleasant
plentiful
poignant
poor
popular
posed
potential
prayerful
pretty
primitive
prone
proportioned
prosperous
proud
pure

quick
quiet

ragged
rambless
raw-boned
real
realistic
relaxed
reminiscent
repressive
resigned
respectful
restful
retired
rich
Roman
romantic
rough
round
rugged
rural
Russian

Descriptive Adjectives

sad
sailor's
salty
Samurai
sandy
satisfied
scolded
seasonal
secure
semi-nude
sensitive
sensuous
serious
shabby
shapely
shipwrecked
short
sick
simple
sincere
single
sisterly
sketchy
sleepy
sloppy
small
smelly
soft
solid
some
sordid
sorrowful
sorry
soulful
spacious
spiritual
statuesque
stern
stocky
stormy
strange
strenuous
strong
studied
stupid
sturdy
successful
surprised
surrealist
symmetrical

APPENDIX G-6

TITLES AND SOURCES OF PICTURES USED IN PICTURE SELECTION TEST

No.	Title	Source
1.	Two Boys	Life, April 28, 1941
2.	The Gulf Stream	W. Homer, Metropolitan Museum of Art
3.	The Nesters	T. Lea, American Painting Today
4.	Dick	Life, November 18, 1940
5.	Senator	Burton, Life, November 18, 1941
6.	Humour	Life, April 21, 1941
7.	Warlike Theme	W. Kandinsky, Art Institute of Chicago
8.	Statesman	C. H. Pepper, Museum of Fine Arts
9.	Bacteria	Parke Davis therap. notes, October, 1941
10.	Woodsman and Fallen Tree	W. Homer, Museum of Fine Arts
11.	Girl	Life, September 15, 1941
12.	Harmonica Player	Binford Julien, Fine Arts
13.	Fishermen Three	J. Costigan, 12 gelatones, Ass. Am. Artists
14.	Aggression	Life, April 7, 1941
15.	Flirt	Life, April 21, 1941
16.	Woman with Plants	G. Wood 12 gelatones, Ass. Am. Artists
17.	Boy	Life, February 3, 1941
18.	Crackers and Cheese	Osterbridge, P., Fine Arts, Boston
19.	Family	Life, November 18, 1940
20.	Night-club	Life, February 10, 1941
21.	Protozoa	Life, October 20, 1941
22.	Sleep-walking	Reed and Cornwick, Jersey City, N.J., October, 1941
23.	Tables for Ladies	E. Hopper, Metropolitan
24.	Boy Seated	J. S. Sargent, Fine Arts
25.	Winter Landscape	Dodge Macnight, Fine Arts
26.	Joueurs aux cartes	Cézanne, Raymond & Raymond
27.	Love scene	Life, October 13, 1941
28.	Toledo	El Greco, Metropolitan Museum
29.	Intellectual	J. P. Priest, Life, November 18, 1941
30.	Beach Combers	J. Whorf, 12 gelatones, Ass. Am. Artists
31.	Girls	Life, August 25, 1941
32.	Forest Fire	Mrs. James Sumers, Life, March 3, 1941
33.	Theatre	Life, October 20, 1941
34.	Scientist	Parke Davis, therap. notes, October, 1941
35.	Love	Life, November 18, 1941
36.	Breton Sailor at Rest	J. Margulies, Ass. Am. Artists
37.	Morning Interlude	R. Brachman, 12 gelatones, Ass. Am. Artists
38.	Humor	Life, October 23, 1941
39.	Cavalrymen Crossing a River	J. French, Life, January 27, 1941
40.	Technique	Life, December 2, 1940
41.	Verbal aggression	Life, October 20, 1941
42.	Poll	Life, April 14, 1941
43.	Medicine	J. Wyeth and Brothers, Inc., Philadelphia
44.	Parking	Life, April 21, 1941
45.	Disappointment	Life, April 21, 1941
46.	Old Man	Life, September 15, 1941
47.	Ulcers	John Wyeth and Brothers, Philadelphia
48.	Nude	Sera, M. H. Hobbs, Ass. Am. Artists
49.	Cotton Pickers	T. Benton, 12 gelatones, Ass. Am. Artists
50.	Fire	Life, January 13, 1941

Individual Score

Yes Perhaps No

27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Sum	Yes	%	Per	%	No	%
																							X	4						
				X						X											X			4						
		X					X		X										X					9						
																						X		3						
																X		X						4						
X								X									X							5						
						X					X	X		X										5						
																								5						
	X		X		X																			4						
													X		X					X				7						
		X					X		X										X		X		X	17						
X			X	X		X		X		X	X	X		X		X	X	X				X		23						
		X	X				X		X			X		X					X					19						
				X						X											X		X	7						
X						X		X			X					X	X	X				X		14						
X			X						X	X								X				X		12						
		X		X		X	X	X			X	X				X					X		X	19						
														X			X		X					9						
	X		X	X	X	X	X				X	X		X		X	X	X				/		24						
								X	X										X		X	/		7						
X		X								X			X		X					X			X	19						
								X										X	X				X	15						
X		X								X								X			X			13						
	X		X				X					X										X		6						
				X	X	X			X															6						
											X			X		X								4						
													X		X					X				6						
									X		X										X			4						
X		X		X		X							X		X		X		X				X	19						
	X		X		X		X	X		X		X		X		X		X		X		X		27						
			X		X								X			X								14						
	X									X												X		5						
									X		X							X			X			7						
								X						X										5						
X		X		X		X	X						X		X			X	X	X			X	19						
27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Sum	Yes	%	Per	%	No	%

PICTURE SELECTION T

Picture	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
I Content																								
Female types											x					x						x		
Nudes																								x
Male types			x	x	x					x							x							
Colored people		x										x												
Family relationships													x						x					
Love scenes															x									
Groups						x																	x	
Aggression	x							x						x										
Landscapes																								
Objects and indefinite							x		x									x			x			
II Content- Analysis																								
Humans: single		x		x	x			x		x	x	x				x	x					x		x
several	x		x			x							x	x	x				x	x			x	
Sex: male	x	x		x	x	x		x		x		x		x			x							x
female											x					x						x		
mixed group			x										x		x				x	x			x	
Social: poor		x	x							x		x		x										
middle	x							x					x		x	x	x					x	x	x
rich				x	x	x					x								x	x				
Activity: active	x		x	x		x		x				x	x	/					x	x	x	x		
passive		x												/										x
static					x		x		x	x	x				x	x	x	x					x	
III General Sentiment																								
Happy, content, successful	x			x	x		x			x	x		x		x				x	x				
Serious			x					x				x				x	x					x		x
Sad, gloomy																							x	
Fearful		x												x										
Humorous						x																		
Indefinite									x									x			x			
IV Color																								
Pencil or etching																								x
Halftone			x		x			x	x			x		x	x			x		x		x		
Color	x	x		x		x	x			x	x		x			x	x		x		x		x	
V Style																								
Art: naturalistic painting		x	x					x		x		x	x			x	x						x	
stylized painting							x																	
sketch						x									x									x
Magazine style	x			x																		x		
Photography					x				x		x			x				x	x	x	x			
Picture	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

APPENDIX G-8

TITLES AND SOURCES OF PICTURES USED IN PICTURE ARRANGEMENT TEST
(Arranged in order of presentation)

Male Series

1. "Play-boy." Life, August 25, 1941.
2. "Peasant." John R. Frazier, "Study," Fogg Art Museum.
3. "College boy." R. Reid, Portrait of George Alexander McKinlock, Fogg Art Museum.
4. "Doctor." L. C. Perry (Portrait of E. Arlington Robinson), Fogg Art Museum.
5. "Farmer." Collier's, September 20, 1941.
6. "Father." J. Y. Hunter, Portrait of Andrew Carnegie, Fogg Art Museum.
7. "Sailor." Life, May 19, 1941.
8. "Executive." Vanity Fair, New York. Thomas Mann.
9. "Cynical father." A. K. James, Portrait of a Professor, Museum of Fine Arts, Boston.
10. "Celebrity." Philip A. Lazlo (R. Bacon), Fogg Art Museum.

Recreation Series

1. "Mountain Solitude." Life, January 13, 1941.
2. "Ritz." Life.
3. "Abandoned." G. E. Browne. Metropolitan Museum of Art.
4. "Baseball." Life, September 29, 1941.
5. "Sailing." Life, August 11, 1941
6. "Steel Structure." R. Marsh. Museum of Fine Arts.
7. "New England Village." Life, April 21, 1941.
8. "Freight." J. C. Pellen. Metropolitan Museum of Art.
9. "Beach." Life, October, 1941.
10. "Camping." J. S. Sargent, Fogg Art Museum.

Female Series

1. "Wife." Nathan Margoulies, Fogg Art Museum.
2. "Girl." Life, February 3, 1941.
3. "Mother." Photographic Magazine.
4. "Lilly." M. Sargent. Ink Head of a Woman. Fogg Art Museum.
5. "Grandma." D. Freedley. Portrait of Mrs. Schuyler Van Rensselaer. Fogg Art Museum.
6. "Julia." Hassam Childs, Portrait of a Girl, Julia. Fogg Art Museum.
7. "Peasant Woman." Life, September 1, 1941.
8. "Darling." Life, April 14, 1941.
9. "Nanette." Collier's, April 13, 1940.
10. "Kid." Life, August 25, 1941.

Art Series

1. "Tramp." Abbott Laboratories Medical Advertisement.
2. "Surrealist Warmonger." Life, November 2, 1941.
3. "Still Life." Life, April 14, 1941.
4. "Picasso." Life, March 4, 1941.
5. "Train." Life, April 11, 1941.
6. "Syphilis." Abbott's, What is news.
7. "Walkure." Abbott's Parke Davis, or Wyeth.
8. "Sand." Life, May 13, 1941.
9. "Train and Horse." (Impressionistic). Life, January 13, 1941.
10. "Sunday painters." Life, September 15, 1941.

APPENDIX G-8 (Continued)

Sex Series

1. "Nude." M. Young, Fogg Art Museum.
2. "Man and Wife." P. Picasso, Fogg Art Museum.
3. "Nude." Paxton, Fogg Art Museum.
4. "Men." J. S. Sargent, Fogg Art Museum.
5. "Harem," Life, April 28, 1941.
6. "Shower," Life, January 13, 1941.
7. "Seated Nude." G. T. Tobin, Fogg Art Museum.
8. "Boy Pulling a Rope." Photographic Magazine.
9. "Nude." Photographic Magazine.
10. "Youth on Horseback." P. Picasso, Fogg Art Museum.

Social Class Series

1. "Exiled." E. Bry, Metropolitan Museum of Art.
2. "Family," middle class. Collier's, October 19, 1940.
3. "Cotton Pickers." T. H. Benton, Metropolitan Museum of Art.
4. "College Tea." Life, May 19, 1941.
5. "Bus Passengers." T. Soyer, Metropolitan Museum of Art.
6. "Voters." Life, July 28, 1941.
7. "Diner."
8. "Farmer." Collier's, August 12, 1939.
9. "Playboys." Life, August 18, 1941.
10. "Five A.M., Elko, Nevada." G. Schreiber, Metropolitan Museum of Art.

Individual Situation Series

1. "Valaulla." A Lorn, etching, Fogg Art Museum.
2. "Home." Life, December 1, 1941.
3. "Public Speaker." Life.
4. "Family." Life, September 8, 1941.
5. "Pullman." Life, September 29, 1941.
6. "Club," Life, January 27, 1941.
7. "Castles in Spain." T. A. Harrison. Metropolitan Museum of Art.
8. "Football." Life, May 19, 1941.
9. "Star," Saturday Evening Post, January 18, 1941.
10. "Age." Dutch interior with figure, A. Menhuyz, Metropolitan Museum of Art.

Activity Series

1. "Boxer." M. Young, Fogg Art Museum.
2. "Asleep." Life, November 24, 1941.
3. "Three Workmen." T. Averistron, Fogg Art Museum.
4. "Rum Cay." W. Homer, Worcester Museum.
5. "Jeune homme couche." E. Beerman, Museum of Fine Arts.
6. "D. Boone." W. Lockwood, Life, January 27, 1941.
7. "Hurricane." Saturday Evening Post, September 6, 1941.
8. "Fight." Saturday Evening Post, August 16, 1941.
9. "Indians." Abbott Laboratories.
10. "Rest." Life, June 23, 1941.

APPENDIX G-8 (Concluded)

Human Relations Series

1. "The Evening Meal." M. Bohm. Metropolitan Museum of Art.
2. "Husband and Wife." Abbott Laboratories.
3. "Boss and Secretary." Life, March 19, 1941.
4. "Mother with Baby." Abbott Laboratories.
5. "Sisters." M. Mower.
6. "Father and Children." Life, September 29, 1941.
7. "Father-son." Saturday Evening Post. September 28, 1941.
8. "Husband-wife." Life, April 28, 1941.
9. "Family." Life, February 3, 1941.
10. "Boys." Life, April 28, 1941.

APPENDIX H

(Supplementary to Section 9)

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APPENDIX H

INTRODUCTION

The material in this Appendix is reproduced, with a minimum of change, from three progress reports submitted by M. J. Wantman from the Statistical Office of the Committee on Selection and Training of Aircraft Pilots at the University of Rochester, and from one progress report by the authors. It is the purpose of this introduction to trace the sequence of these progress reports, and to indicate their relation to the material discussed in the body of this report.

Part 1 shows the means and sigmas of 161 scores, and the biserial correlation of each score with the pass-fail criterion. The computations were made at the University of Rochester, and the results presented in a progress report dated January 16, 1943. For each computation the maximum number of cases was employed for whom test scores and criterion data were available. (Criterion data were lacking for two cadets at the time of this analysis.) Most of these correlations have been reported in the body of this report, slightly modified in some instances by the inclusion of the two cases for whom criterion data later became available. A few scores on which no information is given in the body of the report are indicated by an asterisk.

The twelve variables showing biserial r^ts of .25 or higher were selected for further analysis. This analysis was restricted to the 64 cases on whom complete data were available on all 12 variables. Part 2 compares the basic data on these variables for the original computations and the recomputations, as well as the intercorrelations among the scores. It also presents a regression equation for the 12 variables, which have a multiple correlation of .79. (Some values in Part 2 are presented in coded form, as they were in the original progress report, dated February 4, 1943.)

It was recognized that the multiple correlation computed on 12 variables and 64 cases was subject to great shrinkage. Further multiples were presented in a later progress report (dated March 11, 1943), based on the same 64 cases, but including only two, three or four variables each. These multiple correlations appear in Part 3, Table 1. (The figures are presented in their original coded form.)

The progress report of March 11, 1943, also presented information on several variables not considered in the original progress report. Complete information on these additional variables was available for 116 cadets. Part 3, Table 2 gives means, sigmas, and biserial r^ts for each variable for these 116 cases, and also for the maximum number of cases available on each measure.

The same progress report also included a recomputation of values for all variables shown in Part 1 and for the additional variables of Table 2, based on the 64 cases used in the multiple correlations. These data appear in Part 3, Table 3. (The number of cases is occasionally smaller than 64, as some scores were lacking.)

Part 4 is a reporduction of four tables submitted to the Committee by Dr. Finesinger in a letter dated February 5, 1943. Explanations of the tables are quoted from that letter.

PART 1

CORRELATIONS OF VARIABLES WITH PASS-FAIL CRITERION
(Maximum Number of Cases Available)

Name of Variable	N	M	S.D.	N_p	Bi-serial r
Interviews (cf. Sec. 2, Table 3^B)					
Childhood history	147	2.35	.98	112	.000
School and job history	147	2.08	.82	112	+.030
Health History	147	1.55	.74	112	-.100
Symptoms	147	2.45	1.05	112	+.093
Personality	147	2.32	.90	112	+.110
Sex and emotional adjustment	147	2.05	.74	112	.000
Behavior	147	2.08	.77	112	-.128
Attitude to interview and interviewer	147	1.75	.71	112	+.104
Communication	147	1.85	.74	112	-.133
Score of questionnaire	147	2.93	.96	112	.000
Scores 1-6, composite	147	2.16	.74	112	-.074
Scores 1-10, composite	147	2.19	.69	112	-.007
Ventilation (cf. Sec. 4, Table 10)					
Mean of preliminary period	148	8.76	1.84	117	-.412
Mean of stimulus period	148	9.60	2.48	117	-.230
Mean of recovery period	148	9.51	2.17	117	-.316
% Difference, $\frac{\text{Stimulus-preliminary}}{\text{Preliminary}}$	148	9.93	15.70	117	.166
% Difference, $\frac{\text{Stimulus - recovery}}{\text{Stimulus}}$	148	.25	11.50	117	.025
Pattern of Breathing (cf. Sec. 4, Table 13)					
Score of preliminary 6-minute period	146	16.36	4.72	112	+.132
Score of stimulus 3-minute period	148	8.53	3.07	117	-.100
Score of recovery 3-minute period	147	8.63	3.23	113	-.037
% Difference, $\frac{\text{Stimulus-preliminary}}{\text{Preliminary}}$	147	15.92	59.01	113	.026
% Difference, $\frac{\text{Stimulus - recovery}}{\text{Stimulus}}$	147	-7.55	45.75	113	.026
Respiration Rate (cf. Sec. 4, Table 21)					
Mean of preliminary period	148	12.05	2.90	114	-.080
Mean of stimulus period	148	12.49	3.38	114	-.173
Mean of recovery period	148	12.87	9.25	114	-.035
% Difference, $\frac{\text{Stimulus - preliminary}}{\text{Preliminary}}$	148	4.62	13.23	114	-.234
% Difference, $\frac{\text{Stimulus - recovery}}{\text{Stimulus}}$	148	-4.09	10.33	114	-.191

Name of Variable	N	M	SD	df	Hypothesis
Heart Rate (cf. Sec. 4)					
Mean of preliminary period	136	70.70	10.12	103	=.018
Mean of stimulus period	136	72.51	10.99	103	=.102
Mean of recovery period	135	72.81	11.06	102	=.136
Difference, Stimulus = preliminary Preliminary	136	2.56	5.49	103	.155
Difference, Stimulus = recovery Stimulus	134	-.12	3.61	102	.188
Systolic Tension (cf. Section 4).					
Mean of preliminary period	129	8.22	3.82	98	=.061
Mean of stimulus period	129	8.68	4.84	98	=.045
Mean of recovery period	128	8.27	3.47	97	=.113
Difference, Stimulus = preliminary Preliminary	129	7.83	31.91	98	.013
Difference, Stimulus = recovery Stimulus	128	-.70	19.69	97	.010
Autonomic Nervous System (cf. Sec. 5, Table 35)					
Latency of dermographia	135	19.68	9.37	103	.137
Persistence of dermographia	135	19.68	16.71	103	.161
Pulse delivery output	135	3.79	1.65	103	.033
Standard palmar skin conductance	135	25.79	14.75	103	=.150
Volar skin conductance	135	11.13	6.64	103	=.136
Greatest change in conductance	135	39.99	37.56	103	.083
Differential forehead-palm skin temp.	135	2.30	2.03	103	=.034
Differential forehead-volar skin temp.	135	2.43	1.09	103	.131
Systolic blood pressure	135	132.69	8.57	103	=.005
Diastolic blood pressure	135	(67.1)	9.01	103	=.283
Pulse pressure	135	45.33	11.38	103	.206
Mean heart period	135	.90	.11	103	.155
Mean respiration period	134	3.88	1.16	103	.176
Respiration arrhythmia	116	.05	.04	89	.142
Respiration arrhythmia	124	.58	.42	94	.096
Electroencephalogram (cf. Sec. 6)					
Dominant frequency alpha waves in milliseconds, normal breathing	139	105.22	7.61	108	=.066
Percentage delta activity-third min.	148	2.40	8.41	114	.164
Percentage delta activity-second min.	146	.57	2.49	112	.152

* Not reported in text.

Name of Variable	N	M	S.D.	N_p	Bi-serial r
Rorschach (cf. Sec. 7, Table 53)					
R	146	17.75	6.65	111	-.022
W%	146	45.68	22.93	111	-.088
D%	146	69.32	16.91	111	-.005
F+%	146	85.62	14.57	111	-.190
F-%	146	15.10	14.50	111	.146
M Sum	146	.70	.92	111	.106
C Sum	146	2.00	1.65	111	.012
Y Sum	146	1.18	1.01	111	-.181
H%	146	12.63	12.39	111	.139
A%	146	52.54	16.21	111	.026
F%	146	20.73	11.03	111	.085
Z%	146	7.47	11.46	111	.022
Rejections	145	.44	.99	111	-.076
FC	145	.93	1.08	111	.000
CF	145	.79	.97	111	.128
C	145	.29	.61	111	-.085
S	145	.92	1.01	111	.000
O+	145	.08	.27	111	.000
MF	145	.45	.68	111	.111
FM	145	.09	.31	111	-.162
Rorschach type = introvert	146	1.26	.68	111	.109
Rorschach type = extrovert	146	2.36	1.30	111	-.056
Rorschach type = ambiequal	145	1.11	.46	111	.000
Rorschach type = coarted	145	1.38	.84	111	-.060
Emotions = balanced	145	1.79	1.23	111	.000
Emotions = labile	145	1.62	1.09	111	.137
Emotions = spontaneous	145	1.14	.58	111	-.086
Emotions = mixed	145	1.52	.74	111	-.068
Intelligence level	146	2.99	.46	111	.069
Intellectual achievement	146	2.80	.72	111	.157
Creativeness	146	2.96	.63	111	.073
Rigidity	146	3.05	.81	111	.043
Maturity	146	2.90	.77	111	.099
Contact with humans	146	2.92	.64	111	.077
Suspiciousness	146	3.19	.92	111	.003
Competence	146	2.97	.70	111	-.021
Objectivity	146	2.93	.66	111	-.018
Difference score	146	7.92	2.79	111	-.150
Thematic Picture Test, Scoring Method 1 (cf. Sec. 7, Table 53)					
Full story	83	4.84	2.55	56	-.036
Successful outcome	83	1.87	1.26	56	-.104
Unsuccessful	83	2.11	1.39	56	-.121
Happy	83	1.55	.73	56	-.358
Serious	83	1.40	1.21	56	-.092

Name of Variable	N	M	S.D.	N_p	Bi-serial
Gloomy	83	3.08	1.59	56	-.070
Father	83	.60	.56	56	.006
Mother	83	.55	.25	56	.044
Husband or boy friend	83	.63	.40	56	-.162
Wife or girl friend	83	.68	.48	56	-.252
Children	83	.68	.27	56	-.157
Five-Word Test, Scoring Method 1 (cf. Sec. 7, Table 56)					
Persons	103	12.35	10.18	75	.250
Definite Terms	103	12.42	12.03	75	.098
Feelings	103	9.88	9.96	75	-.457
Abstract	103	26.23	13.60	75	-.356
Physical Activity	103	5.11	4.89	75	.144
Mental activity	103	3.30	3.65	75	-.175
Positive qualifications	103	6.52	5.77	75	.156
Negative qualifications	103	9.13	8.19	75	.086
Descriptive qualifications	103	6.30	5.16	75	.183
Picture Selection Test (cf. Sec. 7, Table 68)					
Nudes	83	2.35	1.31	56	-.014
Love Scenes	83	3.22	1.41	56	-.079
Aggression	83	1.93	1.41	56	-.066
Humans: single	83	10.70	1.00	56	.187
Humans: several	83	13.46	4.30	56	-.045
Sex: male	83	11.01	3.07	56	.116
Sex: female	83	4.73	1.61	56	-.116
Sex: mixed	83	8.34	2.78	56	-.074
Social class: poor	83	5.76	2.61	56	.093
Social class: middle	83	11.48	3.09	56	-.116
Social class: rich	83	6.83	1.80	56	.010
Activity: active	83	14.31	3.99	56	-.113
Activity: passive	83	4.34	1.29	56	.130
Activity: static	83	9.86	2.81	56	.126
Sentiment: happy	83	11.19	2.26	56	.017
Sentiment: serious	83	6.35	2.55	56	-.044
Sentiment: sad, gloomy	83	3.30	1.50	56	-.087
Sentiment: fearful	83	2.88	1.54	56	.000
Sentiment: humorous	83	2.54	1.16	56	.048
Color: pencil or etching	83	2.23	1.08	56	.035
Color: halftone	83	9.23	3.13	56	-.108
Color: color	83	16.59	3.65	56	.047
Style: naturalistic painting	83	8.77	2.49	56	.068
Style: stylized	83	1.63	1.23	56	.106
Style: sketch	83	4.14	1.76	56	-.010
Style: magazine style	83	3.34	1.17	56	-.223
Photography	83	10.26	2.76	56	-.082

Name of Variable	N	M	S.D.	N_p	Bi-serial
Picture Arrangement Test (cf. Sec. 7, Table 69)					
Male: young	66	4.38	1.72	41	-.045
Male: middle	66	5.03	.92	41	.163
Male: old	66	6.02	1.56	41	.019
Female: young	66	4.98	.82	41	.050
Female: middle	66	4.80	.90	41	-.301
Female: old	66	6.89	1.30	41	.189
Sex: male	66	6.25	1.36	41	-.329
Sex: mixed	66	8.36	2.97	41	-.066
Sex: female	66	4.36	1.19	41	.303
Social class: lower	66	6.97	.92	41	.316
Social class: middle	66	5.43	.86	41	-.074
Social class: upper	66	2.83	1.70	41	-.144
Activity: active	66	5.31	1.35	41	.068
Activity: verbal	66	3.85	1.59	41	.209
Activity: passive	66	6.36	1.40	41	-.196
Human relations: father	66	4.46	2.57	41	-.020
Human relations: mother	66	6.49	1.86	41	-.112
Human relations: equal	66	5.38	.61	41	-.124
Handwriting - Muscle Tension (cf. Sec. 8, Table 71)					
Grip pressure	142	32.32	11.55	103	-.067
Grip phases	142	49.40	26.50	103	-.047
Time in seconds	141	21.56	3.84	103	.033

PART 2

REPORT ON THE MULTIPLE REGRESSION EQUATION OF TWELVE VARIABLES IN THE COBB-FINESINGER STUDY[7]

At the request of the Committee, the variables in the Cobb-Finesinger study which yielded the highest correlations with the pass-fail criterion were combined into a single regression equation. Even though the Committee had recommended the use of only eleven variables, since the value of the twelfth correlation was very near to the r ranking eleventh, it seemed advisable to include twelve variables. These r's were based on varying N's. Some of the r's were based on as many as 148 cases while others were based on as few as 66 cases. Table 1 gives the N for each r.

In order to obtain the regression equation it was necessary to have complete cases. Only 64 cases were found to have measures on all twelve variables selected. The intercorrelations and the criterion r's were computed for these 64 cases and combined into the regression equation presented in Table 2.

From the last two columns in Table 1 it may be observed that some of the criterion r's changed when these were computed for group 2, i.e. for the cases for whom all twelve measures were available. The change in r's may be partially accounted for by the difference in the composition of the two groups with respect to "pass-fail."

Table 2 presents the Beta weights for each variable. Variables 6, Five Word Test, abstract; 11, Picture Arrangement, Sex: female; 12, Picture Arrangement, Social Class: lower; 5, Thematic Picture Test, Wife or Girl Friend; 9, Picture Arrangement, Female: middle; and 6, Five Word Test, Persons, appear to be the most important variables in that order.

The multiple correlation for the twelve variables with the criterion is .79. This value, of course, may not be stable when computed for another sample.

In setting up the regression equation, the Standard Deviation of the criterion was taken as 1, and the mean of the criterion was set equal to .625. Thus, negative values and values greater than 1 may be predicted from the equation. These values may be difficult to interpret. This difficulty may be overcome by taking $\sigma = pq$, viz, .48. This would have been the standard deviation used if the criterion r's had been point bi-serial correlations rather than bi-serial correlations.

In view of the change in values for the criterion r's when based on the two different groups described above, it is proposed to recompute the criterion r's for all the variables which were rejected from this multiple correlation study. Some of these rejected variables when based on the 64 cases used here may have criterion r's as large or larger than those of the twelve variables used in this multiple r problem.

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[7] A progress report from the Statistical Office of the Committee on Selection and Training of Aircraft Pilots, submitted by W. J. Wantman, February 4, 1943.

PART 2: TABLE 1

A COMPARISON OF CRITERION CORRELATIONS FOR TWO SAMPLES

Variable Number	Name	N		M		σ		$\%_p$		r	
		1	2	1	2	1	2	1	2	1	2
	Ventilation										
1	Mean of Preliminary	148	64	87.6	94.4	18.4	18.5	77.0	62.5	-.41	-.32
2	Mean of Recovery	148	64	95.1	102.8	21.7	22.7	77.0	62.5	-.32	-.29
	Wenger Data										
3	Diast. Bl. Pressure	135	64	67.1	69.7	9.0	7.9	76.3	62.5	-.28	-.18
	Thematic Picture Test										
4	Happy	83	64	1.5	1.6	.7	.7	67.5	62.5	-.36	-.32
5	Wife or Girl Friend	83	64	6.8	6.2	4.8	4.4	67.5	62.5	-.25	-.37
	Five Word Test										
6	Persons	103	64	12.3	10.1	10.2	9.7	72.8	62.5	.25	.19
7	Feelings	103	64	9.9	12.3	10.0	10.0	72.8	62.5	-.46	-.37
8	Abstract	103	64	26.2	26.6	13.6	14.1	72.8	62.5	-.36	-.37
	Picture Arrangement										
9	Female: middle	66	64	48.0	48.2	9.0	9.2	62.1	62.5	-.30	-.27
10	Sex: male	66	64	62.5	62.2	13.6	13.6	62.1	62.5	-.33	-.33
11	Sex: female	66	64	43.6	43.8	11.9	11.4	62.1	62.5	.30	.30
12	Social Class: lower	66	64	69.6	70.4	9.2	8.4	62.1	62.5	.32	.36

N = Number of cases
M = Mean of group
σ = Standard Deviation of group
$\%_p$ = % of passers in group
r = Bi-serial correlation against pass-fail criterion
Group 1 = Cases available for computation of each r
Group 2 = Cases in Group 1 for whom all twelve measures were available

PART 2: TABLE 2

INTERCORRELATIONS OF TWELVE VARIABLES AND THEIR REGRESSION EQUATION

Variable No.	1	2	3	4	5	6	7	8	9	10	11	12
1	-	.89	.11	.20	.02	-.14	.18	.11	.01	.19	-.20	-.25
2		-	.07	.11	-.00	-.06	.07	.02	.14	.15	-.16	-.21
3			-	.03	.02	-.19	.18	.22	-.10	-.07	.03	.05
4				-	.20	-.34	.27	.20	.02	-.05	.02	-.17
5					-	-.18	.24	.15	-.06	-.01	.04	-.20
6						-	-.54	-.56	.01	.08	-.09	.21
7							-	.61	.01	.09	-.04	.01
8								-	.01	-.02	.09	.06
9									-	-.07	.15	-.19
10										-	-.92	-.04
11											-	.06
12												-

R = .79

β:	.03	-.14	-.16	-.20	-.27	-.25	-.10	-.38	-.26	-.07	.27	.27
Mean:	9.4	10.3	69.7	1.6	1.2	10.1	12.3	26.6	48.2	62.2	43.8	70.4
σ:	1.9	2.3	7.9	.7	.9	9.7	10.0	14.1	9.2	13.6	11.4	8.4

N = 64

Regression Equation:

$$\bar{X}_o = .014X_1 - .062X_2 - .020X_3 - .282X_4 - .305X_5 - .026X_6 - .010X_7 - .027X_8 - .029X_9$$

$$- .005X_{10} + .024X_{11} + .032X_{12} + 2.839$$

PART 3: TABLE 1

MULTIPLE CORRELATIONS AND REGRESSION EQUATIONS FOR DIFFERENT COMBINATIONS OF VARIABLES

	Variable	N	beta weight	Rbis	Multiple correlation and regression equation
A.	Ventilation				$R = .32$
	1. Mean of preliminary	64	-.2674	-.32	$\bar{X}_o = -.1443X_1 - .0277X_2 + 2.2716$
	2. Mean of recovery	64	-.0629	-.30	
B.	Thematic Picture Test				$R = .45$
	1. Happy	64	-.2574	-.32	$\bar{X}_o = -.3655X_1 - .3635X_2 + 1.6505$
	2. Wife or girl friend	64	-.3213	-.37	
C.	Five Word Test				$R = .49$
	1. Persons	64	-.2385	.19	$\bar{X}_o = -.0246X_1 - .0079X_2 -$
	2. Feelings	64	-.0787	-.37	$.0484X_3 + 2.2585$
	3. Abstract	64	-.6832	-.37	
D.	Interaction Chronograph				$R = .22$
	1. S.D. U-W	62	-.1374	-.19	$\bar{X}_o = -.5399x_1 - .1675X_2 -$
	2. S.D. V-X	62	-.0409	-.16	$.0865X_3 + 1.1578$
	3. S.D. A+S	62	-.1060	-.15	
E.	Spirogram				$R = .40$
	1. Points off upper line	63	-.2274	-.29	$\bar{X}_o = -.5594X_1 - .1461X_2 -$
	2. Major fluct.: upper	63	-.2030	-.27	$.0324X_3 + 4.2797$
	3. Minor fluct.: upper	63	-.1418	-.26	
F.	Picture Arrangement				$R = .53$
	1. Female: middle	64	-.2434	-.27	$\bar{X}_o = -.0265X_1 - .0165X_2 +$
	2. Sex: male	64	-.2239	-.33	$.0103X_3 + .0359X_4 - .0492$
	3. Sex: female	64	.1167	.30	
	4. Social class: lower	64	.3017	.36	
G.	Max. r's with criteria and max. inter-r's				$R = .42$
	1. Ventilation: mean of preliminary	64	-.1962	-.32	$\bar{X}_o = -.1059X_1 - .0371X_2 -$
	2. Ventilation: mean recovery	64	-.0844	-.30	$.0217X_3 - .0019X_4 + 3.4386$
	3. Picture arrangement: sex: male	64	-.2953	-.33	
	4. Picture arrangement: sex: female	64	-.0211	.30	
H.	Max. r's with criteria and minimum inter-r's				$R = .63$
	1. Ventilation: mean of preliminary	64	-.2253	-.32	$\bar{X}_o = -.1216X_1 - .3709X_2 -$
	2. Thematic pic. test: wife or girl friend	64	-.3278	-.37	$.0213X_3 - .0215X_4 + 4.1400$
	3. Five word test: abstract	64	-.3003	-.37	
	4. Picture arrangement: sex: male	64	-.2930	-.33	

PART 3: TABLE 2

VARIABLES NOT AVAILABLE IN ORIGINAL ANALYSIS: CORRELATIONS WITH PASS-FAIL CRITERION

Variable	N		$\%_P$		Mean		S.D		r_{bis}	
	1	2	1	2	1	2	1	2	1	2
Interaction Chronograph (cf. Sec. 3, Table 5)										
Mean A - S	126	116	75.4	76.7	2.18	2.13	1.85	1.67	.18	.14
Mean U - W	126	116	75.4	76.7	.05	.04	.36	.36	.22	.23
Mean V - X	126	116	75.4	76.7	.39	.38	.46	.43	.20	.20
Mean θ - O	126	116	75.4	76.7	.09	.09	.16	.14	-.04	-.04
Mean A + S	126	116	75.4	76.7	9.50	9.45	2.16	1.96	.28	.25
S.D. A - S	126	116	75.4	76.7	2.96	2.95	1.19	1.15	.23	.22
S.D. U - W	126	116	75.4	76.7	.45	.45	.23	.24	.03	.01
S.D. V - X	126	116	75.4	76.7	.72	.71	.52	.50	.29	.27
S.D. θ - O	126	116	75.4	76.7	.34	.34	.10	.10	.22	.23
S.D. A + S	126	116	75.4	76.7	3.39	3.27	1.68	1.46	.24	.24
*Coefficient of Variation A - S	126	116	75.4	76.7	1.84	1.91	5.71	5.93	.09	.08
*Coefficient of Variation θ - O	126	116	75.4	76.7	1.95	1.96	25.32	26.37	-.03	-.02
*Coefficient of Variation A + S	126	116	75.4	76.7	.35	.34	.11	.11	.12	.14
Ventilation (cf. Sec. 4, Table 10)										
Prelim. Mean Ventil. Corrected for Body Surface Area	148	116	77.0	76.7	4.65	4.84	.95	.87	-.47	-.50

(Continued)

*Not reported in text.

PART 3: TABLE 2 (Continued)

Variable	N 1	N 2	$\%_P$ 1	$\%_P$ 2	Mean 1	Mean 2	S.D. 1	S.D. 2	r_{bis} 1	r_{bis} 2
Pattern of Breathing (cf. Sec. 4, Table 13)										
Points off lower line	147	116	76.9	76.7	4.10	4.05	1.78	1.80	.20	.13
Points off upper line	147	116	76.9	76.7	5.76	5.78	.60	.54	-.26	-.30
Major fluctuations lower line	147	116	76.9	76.7	2.75	2.72	1.72	1.75	.19	.13
Major fluctuations upper line	147	116	76.9	76.7	4.48	4.51	1.71	1.72	-.32	-.30
Minor fluctuations lower line	147	116	76.9	76.7	3.97	3.85	3.64	3.63	.04	.03
Minor fluctuations upper line	147	116	76.9	76.7	9.81	9.91	4.74	4.42	-.31	-.28
Muscle Tension (cf. Sec. 4, Table 25)										
Mean of 3 min. prelim.	129	116	76.0	76.7	8.14	8.05	3.81	3.62	-.07	-.10
*Max. tension during whistle	129	116	76.0	76.7	9.62	9.56	5.92	5.94	-.05	-.07
Per cent Change	129	116	76.0	76.7	19.74	19.97	40.06	40.52	-.01	-.03
Electroencephalogram (cf. Sec. 6)										
Per cent time gross Beta	138	116	77.5	76.7	23.60	22.85	14.19	13.51	-.18	-.12
Per cent time Dominant Frequency	148	116	77.0	76.7	4.08	4.48	5.33	5.21	.17	.18
Per cent Alpha Activity in Those Frequencies Present at least 5% of the Time	148	116	77.0	76.7	17.92	18.45	13.39	13.04	.16	.11

N = Number of cases
1 = Cases available for each variable
$\%_P$ = Per cent of passers in group 2
2 = Cases in Group 1 for whom all measures were present
r_{bis} = Bi-serial correlation against pass-fail criterion

*Not reported in text.

PART 3: TABLE 5

CORRELATIONS OF VARIABLES WITH PASS-FAIL CRITERION
(All available scores for the 64 cases used in computing multiple correlations)

Variable	N	M	S.D.	N_p	Bi-serial r
Interviews (cf. Sec. 2, Table 38)					
Childhood history	63	2.4	1.1	39	.03
School and job history	63	2.1	0.9	39	.11
Health history	63	1.6	0.7	39	-.10
Symptoms	63	2.5	1.1	39	.00
Personality	63	2.4	0.9	39	-.12
Sex and emotional adjustment	63	2.1	0.7	39	-.10
Behavior	63	2.1	0.7	39	-.20
Attitude to interview and interviewer	63	1.8	0.7	39	.03
Communication	63	2.0	0.7	39	-.11
Score of questionnaire	63	2.9	1.0	39	.05
Scores 1-6, composite	63	2.1	0.8	39	-.12
Scores 1-10, composite	63	2.2	0.7	39	.00
Interaction Chronograph (cf. Sec. 3)					
Mean A-S	62	1.9	1.7	39	-.04
Mean U-W	62	0.0	0.3	39	.05
Mean V-X	62	0.3	0.3	39	.05
Mean θ-O	62	0.1	0.1	39	-.12
Mean A + S	62	8.8	1.8	39	.01
S.D. A-S	62	2.7	1.0	39	-.12
S.D. U-W	62	0.4	0.3	39	-.19
S.D. V-X	62	0.4	0.2	39	-.16
S.D. θ-O	62	0.3	0.1	39	.06
S.D. A + S	62	2.8	1.2	39	-.15
*Coeff. of Variation A-S	62	1.3	2.7	39	-.02
*Coeff. of Variation θ-O	62	3.6	6.9	39	.08
*Coeff. of Variation A+S	62	0.3	0.1	39	-.24
Ventilation (cf. Sec. 4, Table 10)					
Mean of preliminary period	64	9.4	1.9	40	-.32
Mean of stimulus period	64	10.3	2.5	40	-.17
Mean of recovery period	64	10.3	2.3	40	-.29
% Difference, $\frac{\text{Stimulus-preliminary}}{\text{preliminary}}$	64	9.2	13.1	40	.16
% Difference, $\frac{\text{Stimulus-recovery}}{\text{stimulus}}$	64	0.0	5.7	40	.38
$\frac{\text{Preliminary mean ventilation}}{\text{Body surface area}}$	64	5.0	1.0	40	-.44

*Not reported in text.

PART 3: TABLE 3 (Continued)

Variable	N	M	S.D.	N_p	Bi-serial r
Pattern of breathing (cf. Sec. 4, Table 13)					
Points off lower line	63	4.1	1.9	39	.29
Points off upper line	63	5.8	0.4	39	-.29
Major fluctuations: lower line	63	2.7	1.8	39	.16
Major fluctuations: upper line	63	4.5	1.4	39	-.27
Minor fluctuations: lower line	63	4.2	3.8	39	.09
Minor fluctuations: upper line	63	10.8	4.4	39	-.26
Score of preliminary 6-minute period	63	16.7	4.3	39	-.10
Score of stimulus 3-minute period	64	8.7	2.5	40	-.12
Score of recovery 3-minute period	64	8.8	3.2	40	-.07
% Difference, Stimulus-preliminary / preliminary	64	6.1	38.9	40	-.15
% Difference, Stimulus-recovery / stimulus	64	-7.0	52.8	40	.07
Respiration Rate (cf. Sec. 4, Table 21)					
Mean of preliminary period	64	11.8	2.4	40	-.02
Mean of stimulus period	64	12.4	3.0	40	-.14
Mean of recovery period	64	12.9	3.2	40	-.05
% Difference, Stimulus-preliminary / preliminary	64	6.2	13.5	40	-.27
% Difference, Stimulus-recovery / stimulus	64	-5.4	10.6	40	-.24
Heart Rate (cf. Sec. 4, Table 25)					
*Mean of preliminary period	64	71.2	11.3	40	-.06
*Mean of stimulus period	64	72.9	11.4	40	-.02
*Mean of recovery period	64	72.9	11.3	40	-.07
*% Difference Stimulus-preliminary / preliminary	64	2.6	5.5	40	.11
*% Difference Stimulus-recovery / stimulus	64	-0.1	3.7	40	.23
Muscle Tension (cf. Sec. 4, Table 25)					
Mean of preliminary period	63	9.2	3.8	39	.08
*Mean of stimulus period	63	9.8	4.4	39	.07
*Mean of recovery period	61	9.3	3.2	38	-.02
*Maximum tension during stimulus	62	10.7	5.5	39	.04
% Change, Maximum change-mean of prelim. / Mean of prelim.	62	16.8	26.1	39	.00
*% Difference, Stimulus-preliminary / preliminary	62	7.3	17.1	39	-.06
*% Difference, Stimulus-recovery / stimulus	61	1.8	18.0	38	-.12

*Not reported in text.

PART 3: TABLE 3 (Continued)

Variable	N	M	S.D.	N_R	Bi-serial r
Autonomic Nervous System (cf. Sec. 5, Table 35)					
Latency of dermographia	64	20.0	10.3	40	.26
Persistence of dermographia	64	14.1	14.1	40	.11
Total salivary output	64	4.0	1.6	40	-.05
Standing palmar skin conductance	64	27.5	14.8	40	.01
Volar skin conductance	64	12.1	8.6	40	.00
Greatest change in conductance	64	37.8	17.2	40	-.05
Differential forehead-palm skin temp.	64	2.4	2.4	40	-.01
Differential forehead-volar skin temp.	64	2.2	0.8	40	.05
Systolic blood pressure	64	112.6	7.3	40	.01
Diastolic blood pressure	64	69.7	7.9	40	-.18
Pulse pressure	64	42.9	10.1	40	.15
Mean heart period	64	0.9	0.1	40	.03
Mean respiration period	63	3.9	0.8	40	.18
Heart arrhythmia	56	0.1	0.0	35	.00
Respiration arrhythmia	63	0.6	0.3	40	-.01
Electroencephalogram (cf. Sec. 6)					
Dominant frequency alpha waves in occipitals, normal breathing	61	104.3	8.0	39	-.26
Percentage delta activity-third minute	64	1.2	5.1	40	.09
Percentage delta activity-second minute	64	0.1	0.3	40	-.13
% Time gross beta	60	20.4	12.9	37	-.21
% Time dominant frequency	64	4.4	5.1	40	.33
% of alpha activity in those present 5% or more of the time	64	19.3	13.2	40	.36
Rorschach (cf. Sec. 7, Table 52)					
R	64	17.1	6.4	40	-.36
W%	64	48.4	23.3	40	.22
F%	64	68.8	16.4	40	-.13
F + %	64	87.7	14.2	40	-.02
F - %	64	13.1	13.7	40	-.01
M sum	64	0.6	0.7	40	.05
C sum	64	2.0	1.5	40	-.04
Y sum	64	1.1	0.9	40	-.15
H%	64	10.4	8.7	40	-.14
A%	64	57.0	15.6	40	.08
F%	64	21.3	9.3	40	.39
Z%	64	7.0	13.7	40	-.08
Rejections	63	0.4	0.9	40	.20
FC	64	1.0	1.2	40	-.29
CF	64	0.8	1.0	40	.10
C	64	0.2	0.5	40	-.06

PART 3: TABLE 3 (Continued)

Variable	N	M	S.D.	N_p	Bi-serial r
S	64	0.9	1.0	40	-.08
O +	64	0.1	0.3	40	-.02
MF	64	0.4	0.6	40	-.17
FM	64	0.1	0.3	40	-.11
Rorschach type-introvert	64	1.2	0.6	40	.04
Rorschach type-extrovert	64	2.6	1.2	40	-.07
Rorschach type-ambiequal	64	1.1	0.3	40	.11
Rorschach type-coarted	64	1.2	0.7	40	.03
Emotions, balanced	64	2.0	1.3	40	-.20
Emotions, labile	64	1.7	1.1	40	.23
Emotions, spontaneous	64	1.1	0.4	40	-.06
Emotions, mixed	64	1.5	0.7	40	-.07
Intelligence level	64	3.0	0.4	40	-.06
Intellectual achievement	64	2.7	0.7	40	-.02
Creativeness	64	3.0	0.5	40	-.19
Rigidity	64	3.1	0.9	40	-.05
Maturity	64	3.0	0.7	40	-.09
Contact with humans	64	2.9	0.6	40	-.32
Suspiciousness	64	3.2	0.8	40	-.40
Competence	64	3.1	0.7	40	.26
Objectivity	64	2.8	0.7	40	-.14
Difference score	64	7.5	2.7	40	-.02
Thematic Picture Test, Scor. Meth. 1 (cf. Sec. 7, Table 53)					
Full story	64	4.5	2.6	40	-.21
Successful outcome	64	2.0	1.3	40	-.04
Unsuccessful	64	2.1	1.5	40	-.14
Happy	64	1.6	0.7	40	-.32
Serious	64	1.5	1.3	40	-.10
Gloomy	64	3.3	1.7	40	-.02
Father	64	0.6	0.6	40	-.06
Mother	64	0.5	0.2	40	.01
Husband or boy friend	64	0.6	0.4	40	-.29
Wife or girl friend	64	0.6	0.4	40	-.37
Children	64	0.7	0.3	40	-.30
Five Word Test, Scoring Method 1 (cf. Sec. 7, Table 56)					
Persons	64	10.1	9.7	40	.19
Definite terms	64	13.2	13.9	40	.14
Feelings	64	12.4	10.0	40	-.37
Abstract	64	26.6	14.1	40	-.37
Physical activity	64	4.5	4.6	40	.05
Mental activity	64	4.0	4.1	40	-.10
Positive qualifications	64	6.5	6.1	40	.29
Negative qualifications	64	9.7	8.8	40	.14
Descriptive qualifications	64	6.6	5.5	40	.29

PART 3: TABLE 3 (Continued)

Variable	N	M	S.D.	M_p	Bi-serial r
Picture Selection Test (cf. Sec. 7, Table 68)					
Nudes	64	2.3	1.3	40	.09
Love scenes	64	3.2	1.4	40	-.07
Agression	64	2.0	1.0	40	-.06
Humans: single	64	10.6	3.1	40	.03
Humans: several	64	13.5	4.4	40	-.01
Sex: male	64	11.0	3.1	40	.09
Sex: female	64	4.7	1.6	40	-.03
Sex: mixed	64	8.3	2.8	40	-.07
Social class: poor	64	5.7	2.7	40	.08
Social class: middle	64	11.6	3.1	40	-.09
Social class: rich	64	6.8	1.8	40	.03
Activity: active	64	14.3	3.9	40	-.07
Activity: passive	64	4.3	1.4	40	.10
Activity: static	64	9.9	2.9	40	.13
Sentiment: happy	64	11.1	2.2	40	.07
Sentiment: serious	64	6.3	2.6	40	.04
Sentiment: gloomy, sad	64	3.3	1.5	40	-.10
Sentiment: fearful	64	2.8	1.6	40	-.05
Sentiment: humorous	64	2.5	1.2	40	.02
Color: pencil or etching	64	2.2	1.1	40	.02
Color: halftone	64	9.3	3.1	40	-.07
Color: color	64	16.4	3.7	40	.04
Style: naturalistic painting	64	8.7	2.5	40	.05
Style: stylized	64	1.7	1.3	40	.22
Style: sketch	64	4.1	1.8	40	-.02
Style: magazine style	64	3.4	1.2	40	-.15
Photography	64	10.1	2.7	40	-.05
Picture Arrangement Test (cf. Sec. 7, Table 69)					
Male: young	64	4.3	1.7	40	-.07
Male: middle	64	6.0	0.9	40	.13
Male: old	64	6.1	1.5	40	.00
Female: young	64	5.0	0.8	40	.03
Female: middle	64	4.8	0.9	40	-.27
Female: old	64	6.8	1.4	40	.17
Sex: male	64	6.2	1.4	40	-.33
Sex: mixed	64	8.4	2.1	40	-.07
Sex: female	64	4.4	1.1	40	.30
Social class: lower	64	7.0	0.9	40	.43
Social class: middle	64	5.4	0.6	40	-.21
Social class: upper	64	2.9	1.7	40	-.17
Activity: active	64	5.4	1.3	40	.03
Activity: verbal	64	3.8	1.6	40	.26
Activity: passive	64	6.6	1.4	40	-.19
Human relations: father	64	4.6	1.4	40	-.02
Human relations: mother	64	6.6	1.8	40	-.02
Human relations: equal	64	5.4	0.6	40	-.03

PART 3: TABLE 3 (Continued)

Variable	N	M	S.D.	N_p	Bi-serial r
Handwriting-Muscle Tension (cf. Sec. 8, Table 71)					
Grip pressure	64	33.1	8.4	40	.01
Grip phase	64	58.0	32.1	40	.12
Time in seconds	63	21.6	3.9	40	-.04

PART 4

SUMMARY TABLES[8]

The figures on predictability were derived in the following way: The data for each individual variable were plotted and a line was drawn on the plot which demarcated 2 groups of subjects. This line was drawn so as to include the greatest (relative) number of failures. The number of failures demarcated in this way was divided by the total number of failures to give the value presented as per cent predictability for failure. Another figure is presented under total. This represents the number of individuals who were properly sorted in terms of pass and failure. This number is divided by the total group and gives a value for predictability for the whole group. This was done for single items as well as for combinations.

TABLE 1

VENTILATION ITEMS

In all of these items low values are associated with success and high values are associated with failures. On the preliminary ventilation corrected for surface area a division of the plot at 4.50 liters picked correctly, 88% of the failures, 56% of the passers, and sorted correctly 63% of the total series. This is the best single item in the whole battery. The predictability of the other items is given below.

	Failures	Total
1. Preliminary period - mean ventilation corrected for body surface	88%	63%
2. Preliminary period - mean ventilation	88%	48%
3. Stimulus period - mean ventilation	82%	44%
4. Recovery period - mean ventilation	86%	46%

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[8]These tables were submitted to the Committee on Selection and Training of Aircraft Pilots by J. E. Finesinger, February 5, 1943. The introductory paragraph of Part 4 is an excerpt from his covering letter.

PART 4: TABLE 2

SPIROGRAM ITEMS

Of all these items the following showed significant X^2 between failures and passers.	Failures	Total
1. Major Fluctuation Upper	89%	46%
2. Minor " "	77%	33%
3. Points off upper line	97%	38%
4. % points off line	83%	42%

Combination of variables in respiration.

Various combinations of ventilation and the spirogram items were used. The following are the most interesting:

1. Ventilation corrected vs. Minor Fluctuations upper	81%	64%
2. " " vs. Major Fluctuations upper	89%	57%
3. Score K (sum of Major Fluctuations, Minor Fluctuations and points off upper line) vs. corrected ventilation	94%	55%
4. Minor Fluctuation upper vs. Major Fluctuation upper	84%	42%

Combination of Respiration with other variables.

*1. Per cent time regular alpha in those frequencies present for at least 5% of the time plotted against the factor: Ventilation / Body surface	77%	70%
*2. Per cent time alpha occurring in chains of at least 3 waves together of the same frequency, plotted against the factor: Ventilation / Body surface	77%	65%
*3. Muscle tension response to a whistle stimulus combined with the respiration test: Ventilation / Body surface	81%	70%
*4. Heart rate change due to whistle stimulus plotted against the respiration factor: Ventilation / Body surface	74%	65%
*5. Latent period of response to a light stimulus plotted against the respiration factor: Ventilation / Body surface	100%	46%

* Also reported under Electroencephalogram.

PART 4: TABLE 3

PERCENTAGE PREDICTABILITY ON COMBINATIONS OF VARIABLES OF THE INTERACTION CHRONOGRAPH*

	Failures	Total
One plot ($\log M_{A-S}$, $\log CV_{A-S}$)	76%	74%
One plot ($\log M_{A-S}$, $\log CV_{A-S}$, $\log CV_{A+S}$)	76%	76%
One plot ($\log M_{A-S}$, $\log CV_{A-S}$, $\log CV_{A+S}$, $\sigma_{\theta-0}$)	80%	80%
Four plots ($\log M_{A-S}$, $\log CV_{A-S}$)	97%	78%
Four plots ($\log M_{A-S}$, $\log CV_{A-S}$, $\log M_{A+S}$)	97%	81%
Four plots ($\log M_{A-S}$, $\log CV_{A-S}$, $\log M_{A+S}$, $\sigma_{\theta-0} - M_{\theta-0}$)	86%	84%
Four plots ($\log M_{A-S}$, $\log CV_{A-S}$, $\log M_{A+S}$, $\log \sigma_{\theta-0} - M_{\theta-0}$)	86%	84%
Four plots ($\log M_{A-S}$, $\log CV_{A-S}$, $\log \sigma_{\theta-0}$)	83%	90%
Experimental interviews - both doctors ($\log M_{A-S}$, $\log CV_{A-S}$, $\log CV_{A+S}$, $\log \sigma_{U-W}$, $\sigma_{\theta-0}$)	100%	90%

*In the above combinations, the purpose is to obtain the best combination in terms both of selection of failures and selection of the total, that is, one which not only segregates out the failures but also makes the least number of mistakes in sorting.

PART 4: TABLE 4

ELECTROENCEPHALOGRAM MEASURES AND OTHERS

	Failures	Total group
Single EEG tests:		
1.a) Maximum Voltage	86%	41%
b) Number of frequencies present for 10% or more of the time.	66%	54%
c) Per cent time beta activity	56%	51%
Combined EEG tests:		
2.a) per cent time dominant frequency / number of frequencies present for 10% time plotted against Voltage.	83%	49%
b) Total amount of alpha activity in those frequencies which have 10% of their own / The number of frequencies which compose it	74%	50%
EEG tests combined with other tests:		
3 a) Per cent time alpha in those frequencies with at least 5%, plotted against Ventilation / Body surface	77%	70%
b) Per cent time alpha occurring in chains of at least 3 waves together of the same frequency plotted against Ventilation / Body surface	77%	65%
c) per cent time dominant frequency / number of frequencies present for 10% time plotted against muscle tension response to whistle stimulus	84%	56%
Tests other than the EEG:		
4.a) Muscle tension response to whistle stimulus	88%	44%
b) Muscle tension response to whistle plotted against: Ventilation / Body surface	81%	70%
c) Heart rate change due to whistle stimulus plotted against: Ventilation / Body surface	74%	65%
d) Latent period of response to light stimulus plotted against: Ventilation / Body surface	100%	46%

APPENDIX I

Manual for the Cobb-Finesinger Study on the Classification of Pilots

Prepared by:
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10/14/43

OUTLINE OF TESTING PROCEDURES

The testing time for each cadet is two hours. The time for each test and the order in which the tests are taken is as follows:

Interview 30 minutes

Spirogram 30 minutes

"Psychological" tests 60 minutes
- Thematic apperception
- Five-word
- Picture arrangement
- Hand dynamometer
- Constant stimulus shocker

Detailed instructions for each of the tests are presented in the following pages. The instructions include procedures for administering and for scoring the tests. They also indicate what multiple r's are to be computed from each test. Forms for recording data are presented.

Validation of the measures. Scoring weights derived from the earlier study will be applied to the present measures. Every effort is being made to reproduce the conditions of test administration and test scoring which obtained in that study. The resulting scores will then be checked against a pass-fail criterion in which causes of failure are similar to those employed in the original validation.[9]

Reliability. The determination of the reliability of these measures poses a number of problems. It is not possible within the testing time agreed upon to arrange for repetition of many of the measures, nor would such repetition in every case give meaningful results. In certain of the situations, a stereotyped repetition of performance would not be anticipated in a second testing. This is particularly true of the interview and the thematic apperception test. The problems in determining reliability are therefore separately discussed for each of the tests.

a. Interview. In the experimental interview the problem of reliability has a number of aspects such as:

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[9] In addition, the experimenters desire to obtain immediately a listing of reasons for elimination so that they can indicate in advance the types of elimination to be predicted by their tests. A decision remains to be made on this request.

(1) Agreement between successive interviews by the same interviewer. No provision has been made to study this problem.

(2) Agreement between two interviewers. Previous studies will furnish data on the agreement between two interviewers on successive occasions.

(3) Agreement between two interaction-chronograph operators observing a single interview. It will not be possible to study this problem until two interaction-chronographs are available. (It has been suggested that two observers might listen in succession to a recording of the interview. This procedure, however, would not be comparable with the standard procedures, as non-verbal action could not be detected.)

(4) Agreement between two individuals scoring the same series of records. The experimenters feel that this reliability would be very high.

b. Spirogram. It has been proposed that the record for the first three minutes be compared with the record for the second three minutes. It should also be possible to study the agreement between two individuals in scoring the same series of records.

c. Thematic apperception test. A special problem of reliability has arisen in connection with this test. It was originally proposed that the experimenter take a verbatim record of everything that was said during the test. This procedure was not followed in the original testing, however, and it was felt that if it were now introduced, the experimenter might lose important material or the subject might adjust his pace to the experimenter's writing and speak less freely than he otherwise would. It was then proposed either that all discussion be recorded so that the record could be scored independently by two individuals, or that a secretary sitting in an adjoining room should take complete notes which might be similarly treated. An effort is to be made to obtain such recordings for a subsequent study of reliability.

The requirement of recording equipment, however, would seriously restrict the possible utility of the test in the field. A scoring sheet has therefore been devised on which it is possible for the examining psychologist to make a check mark in the appropriate column whenever certain classes of words are used by the subject. Such a check sheet can be very easily scored. Two measures of its reliability have been proposed:

(1) Recordings or stenographic notes can be scored independently by two psychologists.

(2) A psychologist seated in an adjoining room and

hearing the discussion over a microphone can check a form similar to that being used by the examiner.

If these procedures show that rating by a single observer is reliable, the examination need not be restricted to a room with facilities for transmitting conversation to an adjoining room.

A study of the repeat reliability of this test over a period of months might be made on a civilian population. Repetition of the test after only a short interval would present an unnatural situation. A split-half reliability would probably be low in view of the fact that the total range of scores is only ten.

d. Five-word test. In the five-word test the subject himself writes on a special form. These forms can be scored independently by two individuals.

It has been suggested that the scoring of this test could be rendered more objective by restricting the scoring to specific words listed in a dictionary prepared from responses obtained in the original study. The experimenters feel, however, that further words which are equally significant will occur for the first time in the present study. They have therefore proposed that the tests be scored first under the original instructions, which require the judgment of the scorer in deciding which words shall be included, and second, according to the dictionary already developed. If it is found that results obtained from a limited dictionary correlate very highly with those obtained from subjective scoring, the utility of the test will be increased.

It has also been proposed by the experimenters that the five-word test might easily be made into a group test. Pictures could be flashed on a screen or reproduced on record forms. The experimenters are considering bringing a group of cadets together at the end of the study for such a group test. The conditions would be sufficiently different, of course, so that results could not be taken to indicate an exact repeat reliability. Furthermore, if such a test were given to subjects who had not previously discussed each picture it cannot be anticipated that results would be comparable.

e. Picture-arrangement test. If possible, a group of subjects should be required to arrange the pictures on two occasions. This study may be conducted on a non-Naval population.

f. Ability-to-take-it tests. Studies have already been made of the reliability of the two ability-to-take-it tests included in the present battery. It will also be possible to compute right-left coefficients of correlation from the present data.

INSTRUCTIONS FOR STANDARD INTERVIEW

In the interviewing room there are two chairs having a fixed position and the subject is always seated in one of them, and the interviewer in the other. Behind the subject on the wall, at the level of the interviewer's eyes, is to be mounted a large clock with a sweep second hand, large enough to be seen easily by the interviewer, and placed in such a way that the subject is not aware by any turning of the head or of the direction of the eyes that the interviewer is watching the clock. If arrangements can be made, each interview can be recorded, and in such case the most efficient position of the microphone will have to be determined, and then kept in a fixed position.

Instructions

Each question is to be asked in the order indicated, but since they are to be spoken informally, and not read off from a sheet of paper, it is obvious that minor deviations in phrasing will occur. (These deviations in phrasing are permissible.) After the subject answers the question, the interviewer is expected to keep the topic going and elicit more information by the use of one or more of the standard phrases listed below, which he will choose according to the context of the reply.

The interview is not concerned primarily with content. We want to get the subject's behavior while discussing certain topics. Hence we want to use the same topics for all subjects. If during any period the interviewer runs out of questions, he is to rephrase the questions previously asked during the period. We have found that in normal subjects if an interviewer uses the questions plus a judicious use of the standard phrases the interview continues for the prescribed time. It is not necessary to have all questions answered, or even to attempt to include them all.

"STANDARD PHRASES"

WHY?
CAN YOU GIVE ME AN EXAMPLE OF THAT?
HOW DID THAT HAPPEN?
THAT'S VERY INTERESTING.
WHAT DO YOU MEAN BY THAT?
AND?
HOW LONG WAS THAT?
Sustaining monosyllables such as AH, WELL, YES, BUT.
Repetition of last phrases used by subject before he stopped talking.

Interaction Behavior	Statement of Interviewer
Adjustment	
This period of the interview is to last 15 minutes, during which time the interviewer is to adjust as best he can to the subject. That means that he will try to respond when the subject stops talking, and that he will also try not to interrupt when the subject is talking. The emphasis should be on making the subject talk freely and easily. Do not throw questions rapidly at the subject. Take your time.	HOW DO YOU DO, MR. --, WILL YOU SIT OVER HERE? WHAT DID YOU DO BEFORE YOU JOINED UP? WERE YOU LIVING WITH YOUR FAMILY THEN?* HOW MANY ARE THERE IN YOUR FAMILY?* HOW DO YOU GET ON WITH THEM?* DID YOUR FAMILY HAVE ANY DIFFICULTY MAKING BOTH ENDS MEET?* *If the subject has not lived with his family, discuss any other family or social institution he has lived in.
At the end of the fifteenth minute ask the adjoining question, and when it is answered you are to sit and say nothing, and remain inactive, i.e., don't smile or nod your head or in any way respond for 15 seconds. Two things may then happen, either the subject will sit and say nothing, in which case you begin again at the fifteenth second, or he will start to talk and you will once again wait until he finishes and again wait for 15 seconds. A pause by definition is the pause of the interviewer, not of the subject. This is done 10 times.	WHAT KIND OF PEOPLE DO YOU FIND THAT YOU GET ALONG WITH BEST? If there is a 15-second pause, fill in by asking one of the above phrases or by restating the question.

Adjustment

Five minutes. At the end of the above period you will ask the adjoining question, and you will then adjust, in the way defined in the first section, for five minutes.

WHEN YOU WERE A BOY, DID YOU ALWAYS LIVE IN ONE TOWN?

HOW DID THAT HAPPEN?

DID YOU HAVE MANY FRIENDSHIPS?

HAVE THEY CONTINUED FOR LONG?

Interruptions

At the end of the five minutes you will ask the adjoining question, and during the subject's reply you will interrupt with one of the phrases used above, and then will continue talking by rephrasing or expanding from what the subject is talking about. You will continue to talk until he stops talking, and for a few seconds thereafter, and then you will stop and wait for him to begin again. This is to be done 10 times. It makes no difference how long the subject talks before he is interrupted so long as he has spoken one phrase or sentence. The purpose of this is to interrupt the subject and out-talk him 10 times. You do not necessarily stop with a question. You wait until he starts in again and then out-talk him once more. You do this 10 times, in all. We have not found anyone, excepting cases with severe depression, who does not start 10 times.

HOW DID YOU GET ALONG IN SCHOOL?

Adjustment. Five minutes.

At the end of the above period you will ask the following question, and you will then adjust, in the way defined above, for 5 minutes whereupon the interview is ended. Do not forget the last statement adjoining.

HOW LONG HAVE YOU BEEN IN THE NAVY?

HOW HAVE YOU BEEN GETTING ALONG HERE?

THANK YOU, MR. --, FOR COMING IN.

DESCRIPTION OF TERMS USED IN ANALYZING EXPERIMENTAL INTERVIEWS[10]

The analysis of the experimental interviews is concerned with two sorts of factors: the activity of the subject, and the interactions between subject and interviewer. The special symbols which are used in the discussion of these factors are presented in Table I.

Activity of subject. The periods of activity of the subject are indicated by the symbol "A", while periods of inactivity are called "S". (These periods of inactivity were originally called "silences" but this terminology has been dropped in view of the fact that not only speech but also nods, smiles, and other gestures are treated as "action.")

Interactions between subject and interviewer. The interactions between the subject (A) and the interviewer (B) are of four general types: first, individual A acts, individual B is inactive; second, A is inactive and B acts; third, both individuals act; and fourth, both are inactive. The "double actions" and "double inactions," as we call them, may be further subdivided in terms of the individual responsible for the interruption or for the failure to respond. For convenience we have used the letters U, V, W, and X to represent these subdivisions. The letters U and V represent double actions, U representing the case in which individual A interrupts individual B, while V represents the case in which B interrupts A. The use of the word "interruption" implies no judgment of motivation but merely refers to the concurrence of actions of two persons. (This action may be verbal or gestural or both, and on interviewing one of the persons afterward it may be discovered that the action was intended to encourage the other person, and not "to take the floor.") W and X represent two types of double inaction; W represents that case in which individual A fails to respond to individual B, while X represents the failure of B to respond to A (again these failures to respond are not interpreted; they may be due to blocking, retardation, or lack of understanding of what the other partner said).

Each of these double actions and double inactions, U, V, W, and X, can be further classified on the basis of the person who begins to act or continues to act after one of the double actions and double inactions occurs. We represent the persistence of individual A after an interruption in continuing his action by placing a bar over the letter. If person B continues and A drops out, no bar is placed over the letter. Similarly, in the case of double inactions if individual A starts action after a double inaction, whether he or the other person is responsible for the failure to respond, he gets a bar over the W or X to indicate his initiation of action. On the other hand, if individual B acts after the inaction, no bar is placed over the appropriate letter.

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[10]This discussion is adapted from a draft version of the report on the earlier study.

TABLE I

TERMS USED IN ANALYZING EXPERIMENTAL INTERVIEWS

"Action" = talking, nodding, smiling, or otherwise gesturing.

A = the subject
(In line 1 of the interaction chronograph, the symbol "A" also refers to the activity of individual A.)

B = the interviewer

Θ = "bar"; a bar placed over the letters U, V, W, and X to indicate that the subject has continued action after an interruption (when the interviewer has become silent) or has initiated action after double inaction.

O = "no-bar"; instances in which the interviewer continues or initiates action.

S = inactions or ("silences".)

U = interruptions by subject.

V = interruptions by interviewer.

W = failures of subject to respond.

X = failures of interviewer to respond.

Types of Interaction

1. A acts (B is inactive).

2. B acts (A is inactive).

3. Both act.

$\overline{U}$ = A interrupts B, B stops, A continues.

U = " " ", A stops, B continues.

$\overline{V}$ = B interrupts A, B stops, A continues.

V = " " ", A stops, B continues.

4. Both are inactive.

$\overline{W}$ = A fails to respond to B, A starts to act.

W = " " " " " ", B starts to act.

$\overline{X}$ = B fails to respond to A, A starts to act.

X = " " " " " ", B starts to act.

THEMATIC PICTURE TEST
CHECK SHEET

Name:
No:

Special Identification:
Date:

Score

Personal References	1	2	3	4	5	6	7	8	9	10	Total
1. People											
2. Men											
3. Women											
4. Wife or girl friend											
5. Couple or lovers											
Feeling Tone											
1. Happy											

Checked by: (1) Tester ( )
(2) Recorder( )
(3) Actual Score ( )

The mean rank orders for these groups are entered in the proper places on the subject's score sheet, and are treated independently.

The following scores are to be correlated with pass-fail criteria in the psychological tests.

Single Items

Five-word test	1. Abstractions
	2. Personal References
	3. Adjectives
Picture arrangement test	4. Social Class -- Lower
	5. Sex Series -- Male
	6. Sex Series -- Female
	7. Female Series -- Sub-group 2
Thematic picture test -- Personal References	8. People
	9. Men
	10. Women
	11. Wife or girl-friend
	12. Couple or lovers
Feelings	13. Happy feelings

Combinations (Multiple Correlations)

14. 1 + 2 + 3

15. 4 + 5 + 6 + 7

16. 8 + 9 + 10 + 11 + 12

17. 15 + 16

18. 14 + 15 + 16

In the Sex Series (B) pictures numbered 4, 6, 8, and 10 show males; those numbered 1, 3, 5, 7, and 9 show females; and picture number 2, both males and females.

In the Female Series (C) pictures numbered 2, 4, 6, and 10 are classified as sub-group 1; pictures numbered 1, 8, and 9 are classified as sub-group 2; and those numbered 3, 5, and 7 are classified as sub-group 3.

A. Administration of test

The following typewritten instructions, which vary with the series presented, are read just before that series is handed to the subject:

(A) Social Class Series: "This is a series of pictures with various groups of people. What is your order of preference in which you would like to meet these people?"

(B) Sex Series: "This is a series of pictures of nudes. Will you please arrange these pictures in order of your preference, thus deciding which ones are the most desirable according to your taste?"

(C) Female Series: "This is a series of portraits. Suppose you had to spend some time with these individuals. What would be your order of preference among them?"

The series are always presented in the same order. The subject is allowed as much time as necessary for arranging each series, and when he has finished, he hands the folder of cards to the investigator.

B. Scoring of test

After the subject has arranged all the pictures in the order of his preference, the investigator records the preferences on a special form. Since the mean rank order of preference for each type of picture is used for purposes of correlation, the rank orders of the pictures in a sub-group are added and divided by the number of pictures in that specific group. The sub-groups are treated independently.

For example: if the subject has designated the four lower class pictures of the Social Class Series as his second, third, fifth, and sixth choices, the mean rank order = $\frac{2 + 3 + 5 + 6}{4}$, or 4.0. In another instance: if the subject should designate the three pictures of sub-group 2 in the Female Series as his first, second, and fifth choices, the mean rank order = $\frac{1 + 2 + 5}{3}$, or 2.7.

The only sub-groups which are scored are:

1. Social Class Series (A): Lower
2. Sex Series (B): Male
3. Sex Series (B): Female
4. Female Series (C): Sub-group 2

subject is given a minute to record on the special form five separate words in relation to that picture.

The following typewritten instructions are read aloud.

> "I am going to show you these pictures a second time. They will be exposed for 10 seconds each, and then you will have a full minute to write down five words which are supposed to characterize the picture. These words may be either in form of a sentence or separate words, just as you like."

B. Scoring of test. The fifty words written by the subject are then put in categories as follows:

1. Personal references are counted. This list includes all nouns and pronouns denoting persons or groups of persons, proper names, and possessive forms of nouns and pronouns already mentioned. The responses most likely to occur are found in a dictionary compiled for this purpose. In addition, there may be original references to persons, which should be scored in the same manner. Examples of possible responses are: he, they, athlete, crowd, Marie, his, their, athlete's, crowd's, Marie's. This count, divided by the total number of words written by the subject and multiplied by 100, equals the Personal Reference Score.

2. Abstract terms are counted. Most of those likely to occur have been listed in the special dictionary. Included in this category are words expressing feelings, such as "pain" and "happiness," and other abstractions, such as "beauty," "luxury," and "liberty." This count, divided by the total number of words written by the subject and multiplied by 100, equals the Abstraction Score.

3. Adjectives, are counted. An adjective list is also found in the dictionary. Possessive pronouns and nouns should not be included in this class. Examples of adjectives are: happy, tired, exciting. This count, divided by the total number of words written by the subject and multiplied by 100, equals the Adjective Score.

The subject receives three separate scores for this test, recorded on a score sheet under Personal Reference, Abstraction, and Adjective Scores.

3. Picture Arrangement Test

For this test three series, each of 10 pictures in numerical order, are presented to the subject, one series at a time. Each group of pictures has been arbitrarily divided for scoring purposes into three sub-groups, as follows:

In the Social Class Series (a) pictures numbered 2, 3, 5, and 10 are grouped as lower class: pictures numbered 1, 6, 7, and 8 are grouped as middle class; and pictures numbered 4 and 9 are grouped as upper class.

A story is considered to have a happy feeling tone if:

a. The actual words "happy" or "happiness" occur.

b. Words such as glad, enjoyment, jovial, enthusiastic, good time, joyous, gusto, and hearty occur.

c Milder feelings expressed by the words satisfaction, gratification, pleasure, smiling, comfortable, and achievement.

(2) Personal References

All personal references are scored which fall in one of the five possible categories described below.

a. Mixed groups of people, such as family, class of people, group, crowd.

b. Men. One or more males. This does not include the words father, husband, or boy-friend.

c. Women. One or more females. This does not include mother, wife, or girl-friend.

d. Wife or girl-friend.

(1) Actual mention of wife.

(2) Mention or implicit designation for girl-friend (fiancee, girl "in love," sweetheart).

e. Couple or lovers. Actual mention of words couple or lovers.

A score of 1 is given for each personal reference. If several references in one story fall into the same category only the first is scored. Thus, the number of scored points for each story cannot exceed 5. For example, if the subject's third story contains the words "people," "woman," and "lovers" a score of 1 would be given to categories a, c, and e. If the subject's ninth story contains the words "men," "sailors," and "crew," a score of 1 would be given to categories a and b. A final score is obtained for each category by adding the references already noted under each. Thus for each person tested five scores are obtained, which are treated independently.

2. Five-word Test

A. Administration. The 10 pictures used in test 1 are presented a second time in the same order. Each picture is exposed by the investigator to the subject for ten seconds. After each picture is shown the

PSYCHOLOGICAL TESTS

This battery consists of three tests given in succession. The tests are: (1) Thematic picture test, (2) Five-word test, (3) Picture arrangement test.

The subject is brought into the room by the investigator and told to sit at one side of an ordinary table. An ordinary chair is used without side arms. On the subject's side of the table there is a pencil and a mimeographed sheet to be used in test 2. On the investigator's side of the table is a pad of paper, a set of typewritten instructions, a watch, and two stacks of pictures, one to be used for tests 1 and 2, the other to be used for test 3. (The pictures are arranged in a definite order.) The investigator sits down opposite the subject, and the testing is begun.

1. Thematic Picture Test

A. Administration. As soon as the investigator is seated he reads the following typewritten instructions aloud.

> "I am going to show you 10 pictures, exposing each one for one minute. I want you to make up a story around each picture. Tell what has led up to the situation shown in the picture, describe what is happening at the moment and what the characters are feeling and thinking, and say what the outcome will be. Speak your thoughts aloud as soon as you can see the picture, and use your imagination freely."

The subject is handed picture 1 and as soon as he begins to talk the investigator scores the responses on a check list. The subject is allowed to view the picture for one minute, at which point it is taken away. He is allowed to continue his remarks until he has finished. Picture 2 is then given him and the same procedure repeated as for picture 1. The same procedure is continued for all of the ten pictures. Evaluation of the test is made from the record of the tester.

B. Scoring. The stories are analyzed in two general categories, referred to as (1) feeling and (2) personal references, as indicated below.

(1) Feeling

Each story is evaluated for the predominating feeling tone. Those stories in which the feeling tone is that of happiness or of similar affects are noted. Each story in which the feeling tone is that of happiness is given a score of 1. The final score for this aspect of the test is the sum of the scores for the individual stories. The maximum score is 10.

SPIROGRAM SCORE SHEET

Subject's Name_____

Subject's Number_____

Special Identification_____

Age:

Height:

Weight:

Pulse:$_2$

Date_____Time:

How long since last meal:

" " " " drill:

Blood Pressure:

Temperature:

Comments:

Conditions under which test was done	Duration	Sighs	Points off line		Percentage of points off line		Major fluctuations		Minor fluctuations		Metabolism rate	Ventilation	Ventilation / S.A.	Respiration rate	Corrected ventilation / S.A.
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper					
Non-basal	First 6 min.														

RESPIRATION ITEMS FOR FINAL CORRELATION WITH CRITERIA

Single Items

1. Ventilation over surface area.
2. Corrected ventilation in liters.
3. Percentage of points off the upper line.
4. Major fluctuations upper.
5. Minor fluctuations upper.
6. Points off the upper line.
7. Ventilation.
8. Index 1 (Corrected ventilation and percentage of points off the upper line).

Combined Items (Multiple R's)

9. 1 + 3
10. 2 + 3
11. 3 + 4 + 5

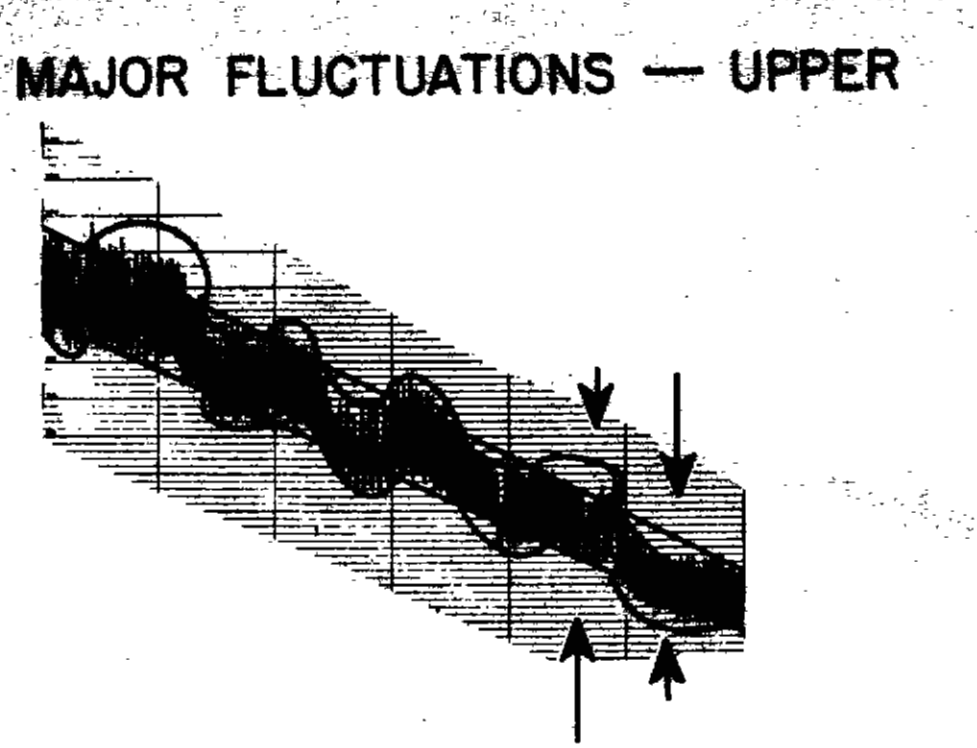

Figure 6. Spirogram showing major fluctuations.

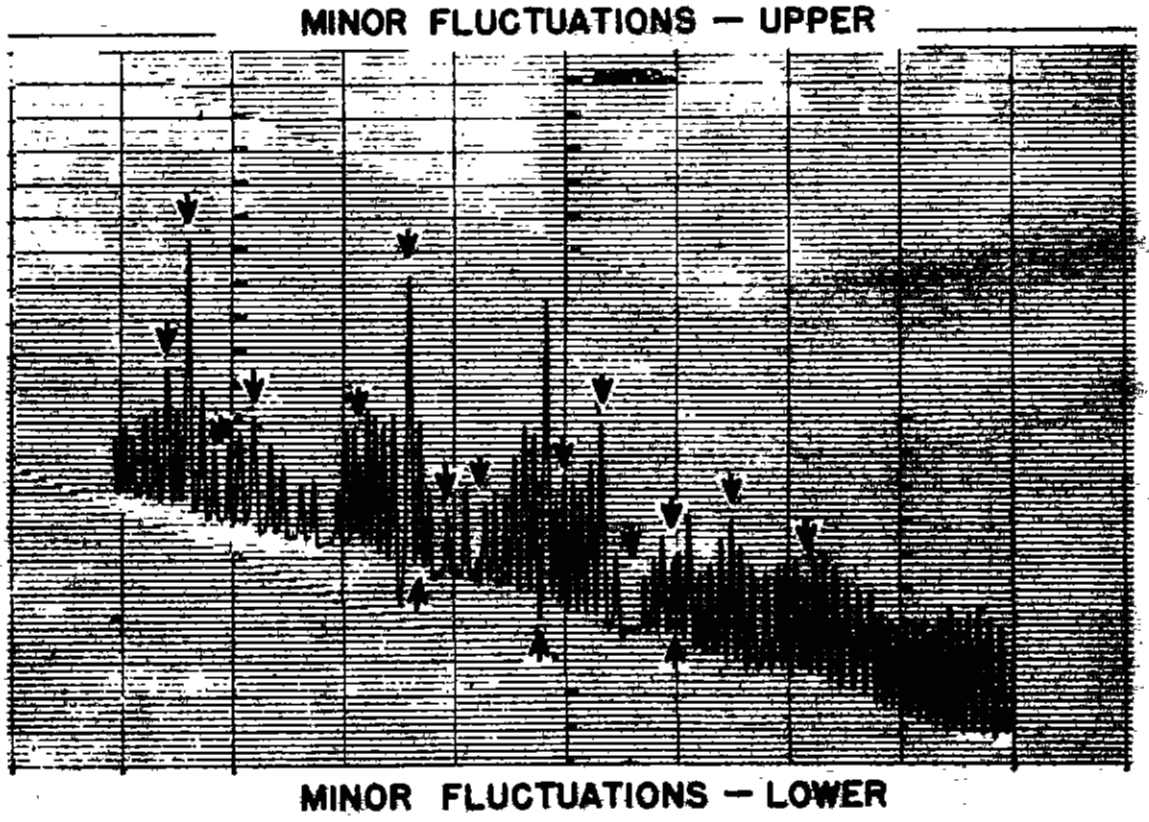

Figure 7. Spirogram showing minor fluctuations.

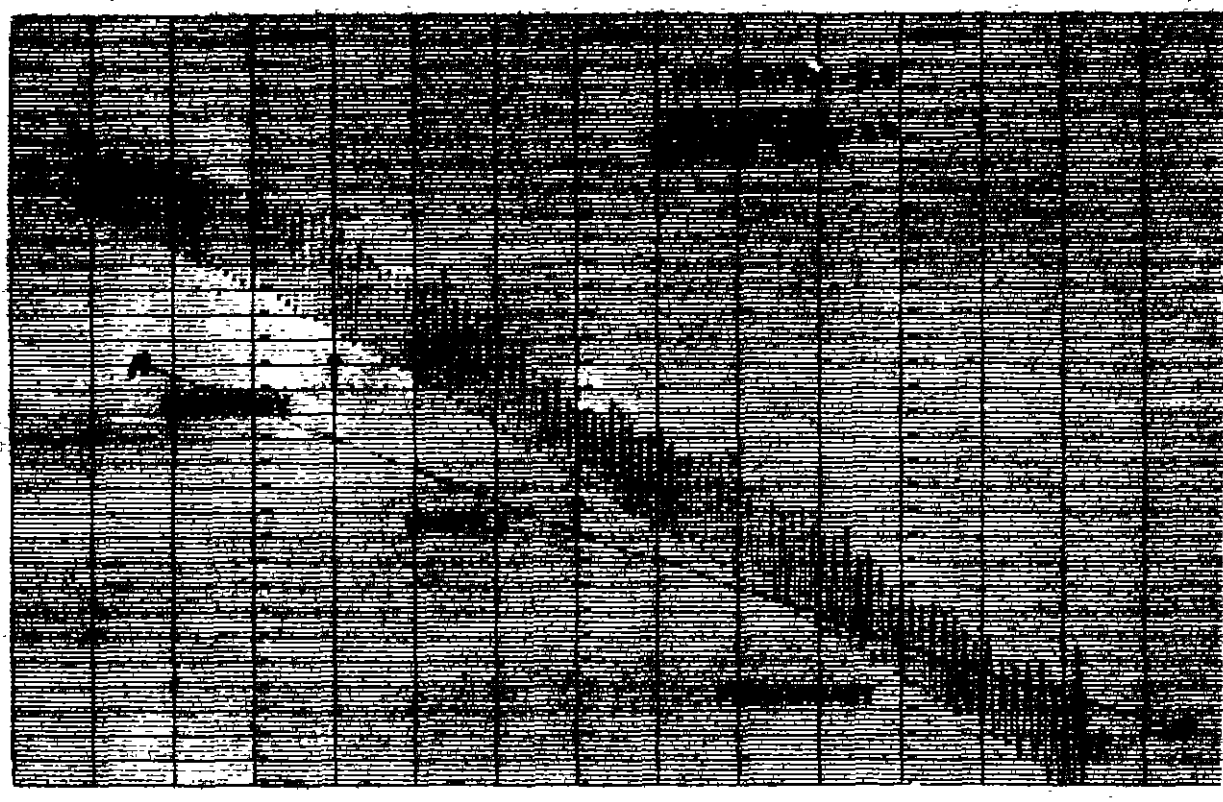

Figure 4. Spirogram with ventilation line (A - A) and respiratory pattern (B - B).

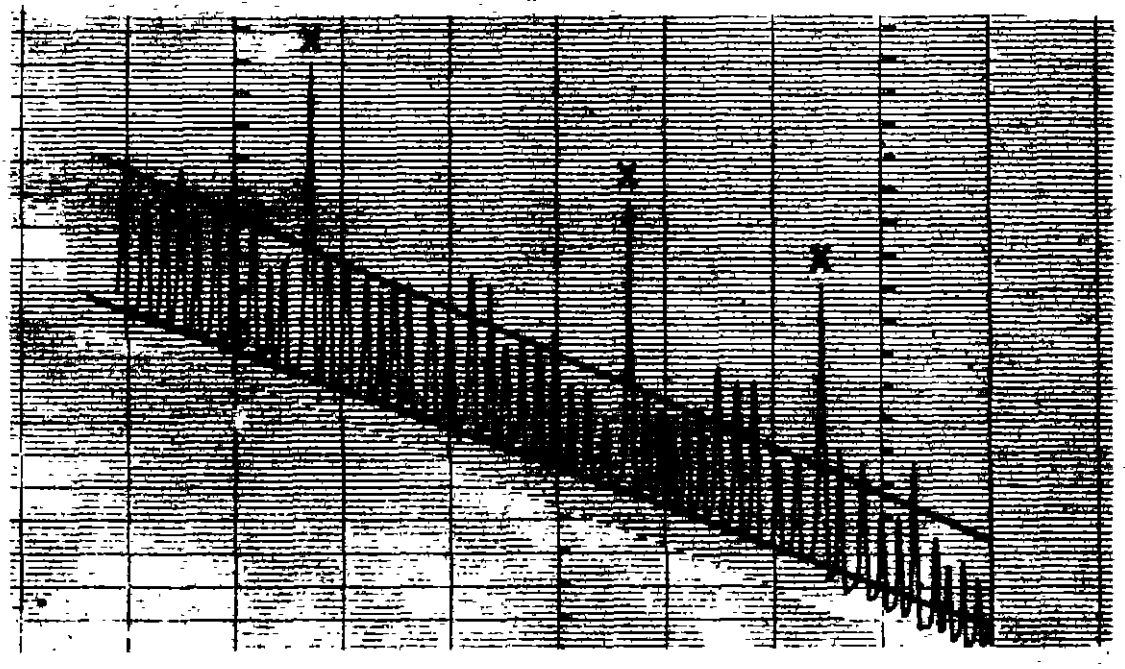

Figure 5. Spirogram with upper and lower reference lines.

Item 3. Major fluctuations upper.

The major fluctuations are large, wave-like irregularities in the tracing readily seen by the eye (Figure 6). A major fluctuation is defined as a succession of respirations in which at least three consecutive points deviate in the same direction from the line of reference, and for which the deviation measures at least 4 mm. for one or more of these points. A major fluctuation ends when three or more points touch the line or deviate from the line in a direction opposite to that of the major fluctuation. Thus, if the major fluctuation is composed of points projecting beyond the line, the three points determining the end of this major fluctuation must either touch the line or fall short of the line, and vice versa if the major fluctuation is composed of points falling short of the line, the fluctuation then continues until three successive points touch or project some distance beyond the line. The score for Item 3 is obtained by adding the number of major fluctuations for the upper points for the six minute period, assigning an arbitrary value of 1 to each fluctuation.

Item 4. Minor fluctuations upper.

The minor fluctuations are the abrupt and short irregularities which to the eye appear like spikes or notches in the tracing (Figure 7). A minor upper fluctuation can involve only three or four consecutive upper points. When three points are involved, the middle point must be elevated above the others and by at least 4 mm., or depressed below them by the same amount. When four points are involved, only one of the middle two points need show this deviation above or below the first and fourth points. The upper minor fluctuations are counted for the six minute tracing, and a value of 1 is assigned to each in arriving at the total score for this item. It will be noted that the determination of minor fluctuations does not involve the lines of reference. A minor fluctuation may or may not be part of a major fluctuation.

1. Percentage of points off the upper line
2. Points off the upper line
3. Major fluctuations upper
4. Minor fluctuations upper

The changes in phase of respiration appearing in the spirogram are here referred to as upper and lower transition points, or, more briefly, as upper and lower points. Where the upstrokes of the recording pen correspond to inspiration (as in the tracings studied in the present series) the transition from inspiration to expiration occurs at the upper points, and the transition from expiration to inspiration at the lower points. A line is drawn so as to be within one millimeter of the greatest number of points at the top of a six minute spirogram. This line is referred to as the upper line of reference (Figure 5). By definition, the upper points are considered as "touching" their respective reference lines if they fall within one millimeter of the line. Points that do not touch the line are referred to as projecting beyond the line on the one hand (falling above the upper line for the upper points) or falling short of the line on the other hand (below the upper line for the upper points). Measurements from the line of reference to the points are always made perpendicular to the horizontal axis of the paper.

Item 1. Percentage of points off the upper reference line.

The total number of upper points is counted for a six minute period. The number of points which fail to touch (see definition of "touching the reference line" above) are counted (Figure 5). The percentage of points off the upper line of reference is calculated as follows:

$$\frac{\text{number of upper points that do not touch the line for six minute period}}{\text{total number of upper points}} \times 100 = \%\text{ of points off the upper reference line}$$

Item 2. Points off the upper line.

For each minute of the tracing the number of upper points that do not touch the reference line (projecting beyond or falling short of it by at least 1 mm.) are counted. An arbitrary rating of 1 is assigned to each minute if 50% or more of the points for each minute fail to touch the line (Figure 5). This value is calculated as follows:

$$\frac{\text{number of upper points that do not touch the line for each minute}}{\text{total number of points for each minute}} \times 100 = \%\text{ of points off upper reference line}$$

If the value is 50 or more the score is 1. If the value is 49 or less the score is 0

The score for the six minute tracing is the sum of the scores for each minute. Each six minute period can have a maximum rating of 6 or a minimum rating of 0.

side if there is to be a clear view of the subject and the interviewer. A black cloth should be arranged behind the observer to keep the light out.

b. The room where the interview takes place should be well lighted, since it is the contrast between the lighting on the two sides of the one-way screen that makes it work.

C. Recording an Interview

1. Wait until the interviewer has told the subject to sit down (the subject will sit on the observer's left) and then speaks again. Press key B (right key) while the interviewer is speaking, and push switch to turn on chronograph, so that the record will start with the interviewer speaking and the subject silent.

2. Press key A whenever the subject is acting (this includes talking, nodding, smiling, or otherwise gesturing) and the right key whenever the interviewer is acting. "Acting" means response, in any form, to the other person. It makes no difference whether the response is a smile, a sigh, a grimace, or a verbal response. A nod of agreement is just as definite a response as a verbal yes. Remember to record double actions and silences (when both are acting or silent).

Do not record as action, however, any persistent, continuous act which does not seem to be a response to the interviewer. For example, if the subject cries during the entire interview, this should not be recorded.

It is necessary to press the keys quite firmly to make them record.

Always look at the person who is not talking. That way it is possible to detect non-verbal action.

3. The first or fourth pens may move all the way over to the edge of the paper on the right or on the left during the observation. If this happens, lift it up and move it back to the middle before it gets to the edge of the paper.

4. If the interviewer is on the observer's left, and the subject is on the right, the observer should reverse the key box, so that the left hand key is still used for the person on the left.

5. Signals in the form of set questions are given by the interviewer during the observation (see interview form). Mark on the fifth curve at the exact position on the abscissa where the pen was at the time the signal was given.

D. Treatment of Record

For description of working of apparatus see Section A.

1. Use is made of a grid scale made of transparent plastic with horizontal and vertical lines on it. The vertical lines are spaced by a distance equal to that which the paper is moved by the paper transport, in short, the vertical lines represent units on the abscissa of the five curves.

Along the vertical lines are marks like those on the edge of a ruler. These marks represent a scale adjusted to the distance moved by the pens (either up or down) during a second, and are thus used to measure values on the ordinate for the five curves. There is one heavy horizontal line through the center, and finer horizontal lines connecting marks on the vertical scales representing intervals of 10 seconds.

2. The first step is to draw on the paper record a base line parallel to the edges of the paper. On this base line are marked positions where the plastic grid is to be placed so that the abscissa measurements will be accurate. Since these positions are different for the different curves, these marks should be made with different colored pencils corresponding to the colors of the inks used for the different curves.

3. To get mean values for the whole interview, it is convenient to have all the curves start from the same position (vertically) on the paper, using marks which indicate the center, and to use this position for drawing the base line. Thus the vertical distance of the end of a curve from this base line, which can be measured with the scales on the plastic grid, represents the total movement of that curve on the ordinate as measured in seconds. This value is divided by the number of units on the abscissa to obtain the mean.

The S - O curve has a different scale from the others, as regards its movement on the ordinate, and the values obtained must be multiplied by a conversion factor (.1351) to obtain the true value.

4. To get mean deviations, the value for each 4 units of interaction, given on the grid scale, is read off. The first differences of the values are then calculated and then the deviations of each of these values from the mean. The mean deviation is then calculated and multiplied by the constant 1.266, giving an approximation to the standard deviation.

In the above, the deviations are added, and the total divided by the number of units on the abscissa. Since the plus and minus deviations should be equal, if they are added separately, this gives us a check on the accuracy of this procedure.

E. Indices

To construct indices in the previous series we used standard deviations for the different curves. In the new study we propose to use mean deviations (X 1.266) for the same purpose, since it is much quicker and therefore less costly to get these values, and since the one is a close approximation of the other.

Index 1: Logarithmic functions of these means and sigmas[13] are used. Log mean (A - S) is plotted (on the ordinate) against log coefficient of variation (A - S). For each pilot the values for log coefficient of variation (A - S), log sigma (Θ - O), and log sigma (U - W) are added in a diagonal direction (45°) away from the origin. When this has been done, the index value for each pilot is represented by the perpendicular distance of the point so determined from a base line of slope minus one drawn anywhere that is convenient. (In comparing index values taken from different plots a standard position for this base line would, of course, have to be determined.)

Index 2: Here the same technique of using for index values the perpendicular distances of points from a line of slope minus one is employed. The determination of the points is in this case a simple plot with sigma (A - S) on the ordinate and with sigma (Θ - O) plus $\frac{\text{sigma (U - W)}}{2}$ on the abscissa.

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[13]The term "sigma" as here used refers to the mean deviation corrected as indicated above.

INTERACTION CHRONOGRAPH ITEMS FOR FINAL CORRELATION WITH CRITERIA

Single Items

1. Index 1
2. Index 2
3. Mean (A - S)
4. Mean (A + S)

Combined Items (Multiple R^2s)

5. Index 1 · Index 2
6. Index 1 with Respiration Index 1
7. Index 2 with Respiration Index 1

5. 1 Work Sheet: Interaction Chronograph

r No. Name Date

-S	△	MD	U-W	△	MD	V-X	△	MD	θ-O	△	MD	A-S	

2 Work Sheet: Interaction Chronograph

Order No.	Name	Date Time	Int. Observer

T = ("+n" minus "-n") (M - A)

MD = $\frac{\text{Sum Dev.} - T}{n}$

Means	A - S		U - W		Q - O		A + S		V - X	
Preliminary		m		m		m		m		m
n =										
Silences		m		m		m		m		m
n =										
Recovery		m		m		m		m		m
n =										
Interruptions		m		m		m		m		m
n =										
Recovery		m		m		m		m		m
n =										
Total		m		m		m		m		m
n =										
MDs	A	M - A	A	M - A	A	M - A	A	M - A		
plus dev.		+n		+n		+n		+n		
minus dev.		-n		-n		-n		-n		
sum										
T										
n (MD)										
MD										
Content										

RESPIRATION

Apparatus. The items in respiration which are to be used are: (1) total ventilation, (2) pattern of respiratory tracing. Both are obtained from a record of the subject's breathing as obtained by means of the Warren Collins modification of the Benedict Roth apparatus. This apparatus is one of the standard types used clinically for the measurement of basal metabolic rate, and is equipped with a ventilometer.[14] The subject breathes through a mouthpiece into the apparatus, which has a nine liter bell filled with oxygen. The system is closed by the use of a nose clip on the subject; breathing takes place entirely through the mouth. With each inspiration and expiration the bell moves down and up. The movements of the bell are recorded in reverse by an ink pen on a record which is fastened to the kymograph. Thus inspiration is represented as an upward line and expiration as a downward line. There is a greater pause between expiration-inspiration than between inspiration-expiration. Hence in the record the transition between expiration and inspiration has the configuration of a trough, seen at the lower part of the tracing, while the transition between inspiration-expiration is pointed and is seen at the upper part of the tracing. The speed of the paper is 3.2 cm. per minute. The horizontal axis is ruled in centimeters; the vertical axis is ruled in minutes, so that the distance between two lines represents one minute. The reverse side of the paper contains the Boothby-Sandiford nomograph used for calculating the surface area from the height and weight of the subject. The bell is filled at the beginning of each test with 100% oxygen.

Procedure. The subject lies quietly on his back alone in the room for a period of 15 minutes. One minute before the subject is attached to the apparatus the tester walks into the room and takes the pulse for 30 seconds. The subject is then attached to the apparatus, and breathes for a period of eight minutes. During this period the record is made. A test is made for leaks during the seventh minute. This is done by placing a metal collar, which is a part of the apparatus, over the bell during the seventh minute of the test. The presence of a leak results in the escape of oxygen from the bell, which is reflected in the record by a sharp rise in the successive troughs during this minute. If a leak is detected, the test is repeated at a later date. During the eighth minute the pulse is taken again for 30 seconds and the barometric pressure and the temperature of the machine are recorded. The subject is disconnected from the apparatus, and asked to remove his shoes. His height and weight are then taken. His age is recorded. He is also asked how long since his last meal and since his last strenuous exercise other than marching.

Instructions to the subject. On entering the room the subject is told: "Will you please loosen your collar and tie." He is then told: "Will you please lie down and relax for 15 minutes." When the apparatus is adjusted

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[14] The apparatus is manufactured by Warren Collins, Inc., Boston. Recording paper and special nose clips and mouth piece can be obtained from the same company

after the 15-minute period he is told: "Close your eyes and breathe along now." After the test he is told: "Thank you for coming in."

Analysis of the record. On each record two types of tracing can be seen (Figure 2), a cumulative line representing the tracing of the ventilometer pen (A - A, Figure 4), and the ordinary spirogram or breathing pattern (B - B, Figure 4). The first tracing is considered in determining the ventilation values, and the second in determining the pattern of breathing. The analysis is made as follows:

A. Ventilation

Total ventilation (the amount of oxygen breathed in per minute) is measured directly from the spirogram record and expressed in liters per minute, as described below. The apparatus used was equipped with a ventilometer, which was adjusted so as to reduce the size of the inspiration line by a ration of 1:25. The actual determination of the ventilation values is made by measuring the total vertical displacement of the ventilometer pen for a six minute period (line A - A, Figure 4). The ventilation is calculated by multiplying the upward displacement for the six minute period by 25 (the ventilometer factor). This gives the length in millimeters on the tracings of the sum of all the inspiratory lines. This factor is converted into cubic centimeters by multiplying by 20.8, the calibration factor of the apparatus. The resulting value represents the total ventilation for the six minute period in cubic centimeters. To obtain ventilation per minute the value obtained is divided by six. This is reduced to liters by dividing by 1000.

$$\frac{\text{6 minute ventilometer tracing} \times 25 \times 20.8}{6 \times 1000} = \text{Minute Respiratory Volume in liters = ventilation}$$

This value is the mean uncorrected respiratory volume, or total ventilation. In order to make the data from individual to individual comparable, the total ventilation was corrected for the surface area of each subject determined from the height and weight by the use of the Boothby-Sandiford nomograph. This value is inserted in the denominator of the equation above and the resulting equation is:

$$\frac{\text{6 minute ventilometer tracing} \times 25 \times 20.8}{6 \times 1000 \times \text{body surface area}} = \text{Ventilation over surface area.}$$

A third value for ventilation is presented. This value is the same as the one above except for the fact that the volume of oxygen is corrected for the barometric pressure and the temperature. This is done by multiplying the numerator of the above fraction by a factor which corrects for both of these. The equation is:

$$\frac{\text{6 minute ventilometer tracing} \times 25 \times 20.8 \times \text{TP factor}}{6 \times 1000 \times \text{body surface area}} = \text{corrected ventilation in liters.}$$

B. Pattern of Breathing

The respiratory pattern (tracing B - B, Figure 4) is analyzed so as to obtain data on the following items:

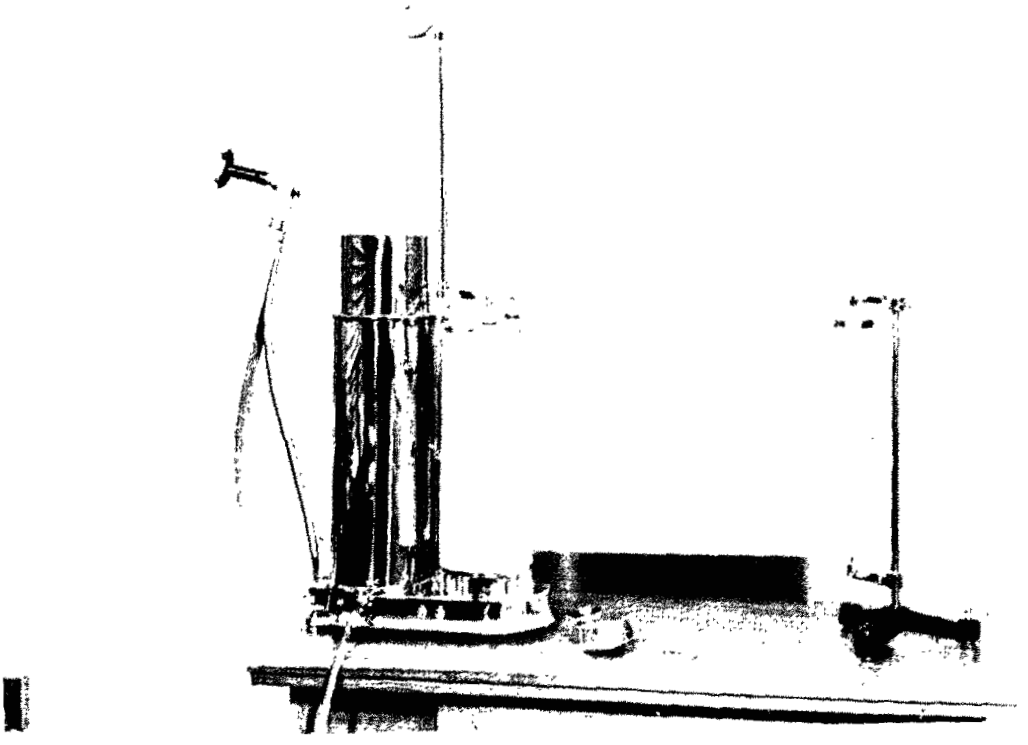

Figure 3. Warren-Collins model of the Benedict-Roth metabolism apparatus equipped with a ventilometer.

loud-speaker in the observation room. Thus the observer is able to hear the entire interview.[12]

2. Adjusting chronograph (see Figure 2)

a. Inserting paper. Fresh rolls of paper are inserted at the back of the chronograph by pushing the rod with one-inch guide on it through the wooden roll, held between the struts, placing other guide on end and inserting the whole thing in other end of frame. The paper should lead off the bottom of the roll so that the roll revolves clockwise when observed from the right. The paper is pulled under the cross bars which carry the penholders, and fastened to the rewind roller with scotch tape.

b. Move fourth pen to the center of the paper by disengaging pen from the chain. See that the base of the pen is caught again in chain at the center. (Center is marked with a line on the bars which guide the pens across the paper.)

c. Move first, second, third, and fifth pens to the center by lifting weight to disengage penholder from lead-screw.

d. Check ink flow in pens by pressing point gently against a piece of paper, then lifting. Insert pens in penholders. Pens have different colored inks.

e. Wind the rewind roller by inserting key at right end.

f. Write on paper subject's name, interviewer's name, the date, the interview number for this particular subject (and the description of the subject, if desired).

g. Plug in chronograph.

3. The phonograph

a. Connect phonograph with microphone attachment in interview room.

b. Plug in phonograph (AC).

c. Turn on phonograph and adjust volume.

4. The observation window

a. No light should reach the observation window from the observer's

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[12]If rooms so equipped are not available, the observer can be seated behind a one-way screen in the interview room or if necessary in a corner of the room away from interviewer and subject.

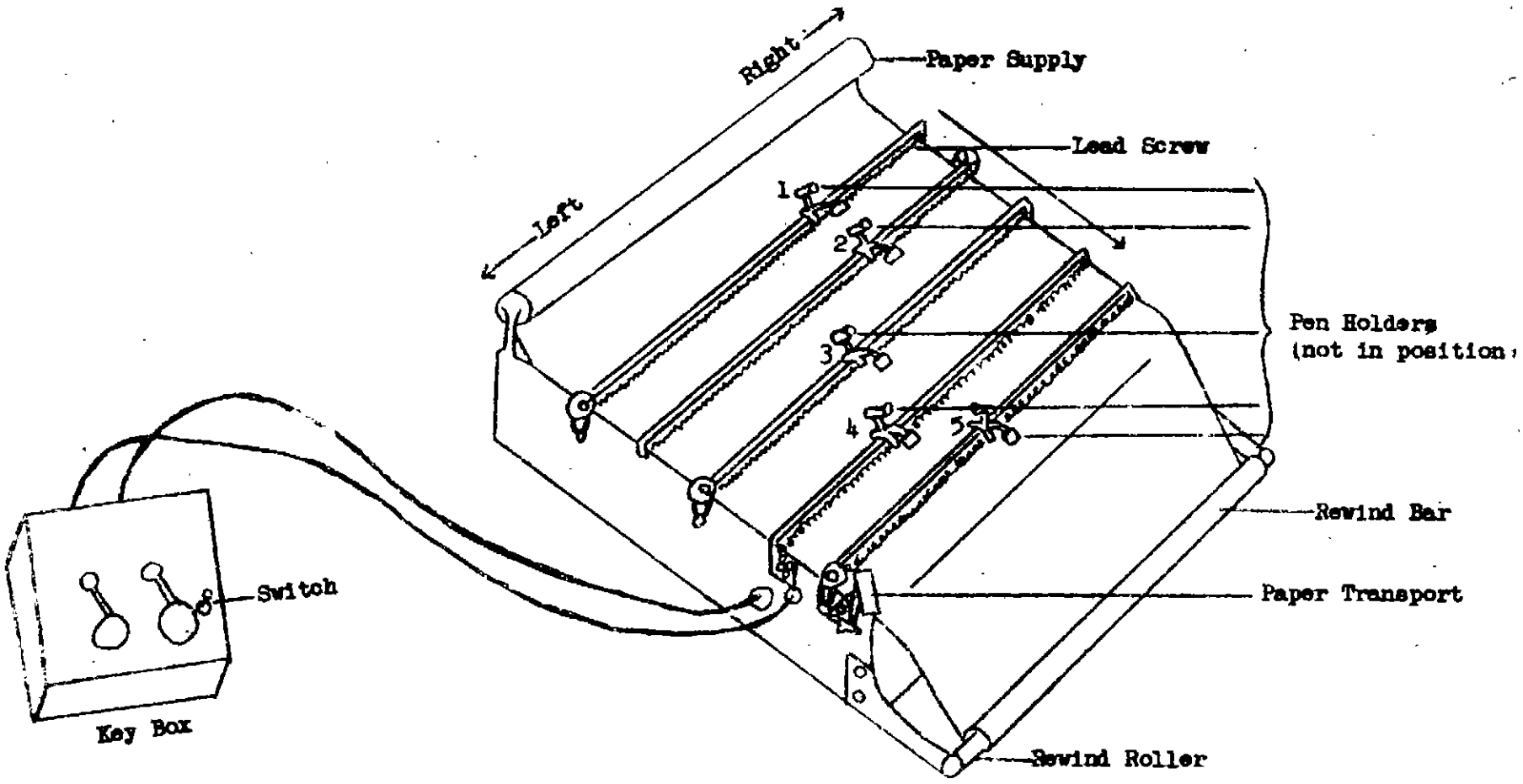

FIGURE 2

INTERACTION CHRONOGRAPH

INTERACTION CHRONOGRAPH

A. Description of the Interaction Chronograph

The interaction chronograph, as shown, (Figure 2) consists of a key box with two keys, connected by wires to a machine which moves five pens to the left or right across a two-foot wide strip of paper. The paper is pulled from the roller at the back of the machine, under the pens, to the rewind roller. The movements of the paper and the five pens are controlled by the two keys as follows.

The paper is moved forward in jumps. It makes a jump every time key A changes position, whether it is pressed down or let up.

Pen 1 (A - S) moves to the left when key A is held down, and to the right when key A is up. This motion is independent of key B.

Pen 2 (U - W) moves to the left when both keys are down provided B was down first; it moves to the right when both keys are up, provided B was up first.

Pen 3 (V - X) moves to the left when both keys are down provided that A was down first; it moves to the right when both keys are up provided that A was up first.

Neither pen 2 nor pen 3 will move unless both keys are up, or unless both keys are down.

Pen 4 (Q - O) moves in jumps, unlike the others, which have a continuous motion. After both keys are down, Pen 4 will jump to the left if key B is let up, to the right if key A is let up first. After both keys are up it will jump to the left if A is pressed down, and to the right if key B is pressed down.

Pen 5 (A + S) moves constantly to the left.

B. Setting up Chronograph for Observation

1. Observational situation

The interview between interviewer and subject takes place in a room which is next door to the room where the observation is made. Between the two rooms is a one-way screen (Gesell mirror), actually a half-silvered mirror which appears to be an ordinary mirror to the subject, but acts as a transparent window for the observer, under proper conditions of illumination. Through this window the observer can see every movement of the interviewer and the subject.

A concealed microphone is connected in the interview room with a

Representation of action and interaction by the interaction chronograph. The interaction chronograph is a device which plots five curves for each interview, four of which are in alternating series. An alternating series is a continuous summation of a sequence of positive and negative terms. These terms alternate; that is, each positive term is followed by a negative term which is in turn followed by a positive, etc. By regarding the actions as positive and the inactions as negative and treating them in a series of this type (plotted automatically by the interaction chronograph), we obtain a graphic representation of the increment or decrement of action durations against the durations of the inactions. The cumulative sum of the alternating series is plotted on the ordinal, and units of interaction, consisting of one action and the subsequent inaction, are plotted on the abscissa. The ordinal is divided into a positive or plus section and a negative or minus section. If each action is approximately equal to its subsequent inaction, the sum will equal zero and the graph will be parallel to the abscissa. If each action is much longer than each inaction, the graph will climb rapidly (with a steep slope) on the positive portion of the graph. If the inactions are much longer than the actions, the reverse is true and the curve will proceed downward in the minus portion of the chart.

Figure 1 is a record from one interview. One line represents the pilot's activity curve (A - S), his actions (A) minus his silences or inactions (S). The second curve consists of the pilot's interruptions (U) of the interviewer minus his failures to respond (W), and is called the pilot's adjustment curve (U - W). If this curve rises, the pilot's interruptions of the interviewer are more frequent or longer, or both, than his failure to respond, and conversely. The next curve is the interviewer's adjustment curve (V - X), which consists of his interruptions (V) minus his failures to respond (X). It consists of the algebraic sum of the interviewer's interruptions of the pilot together with the pauses due to his failure to respond to the pilot. The fourth curve (Θ - O), or bar no-bar curve, is the pilot's initiative curve. It consists of a numerical count of his continuations of action after an interruption (when the interviewer becomes inactive) plus his initiations of action after both are inactive which make up the bars (Θ), minus the interviewer's continuations of action together with his initiations of action, the no-bars (O). The fifth curve is a simple cumulation and gives the frequency per second with which the subject starts action, and is called his frequency or speed curve (A + S); it is measured from the beginning of one action to the beginning of the next.[11]

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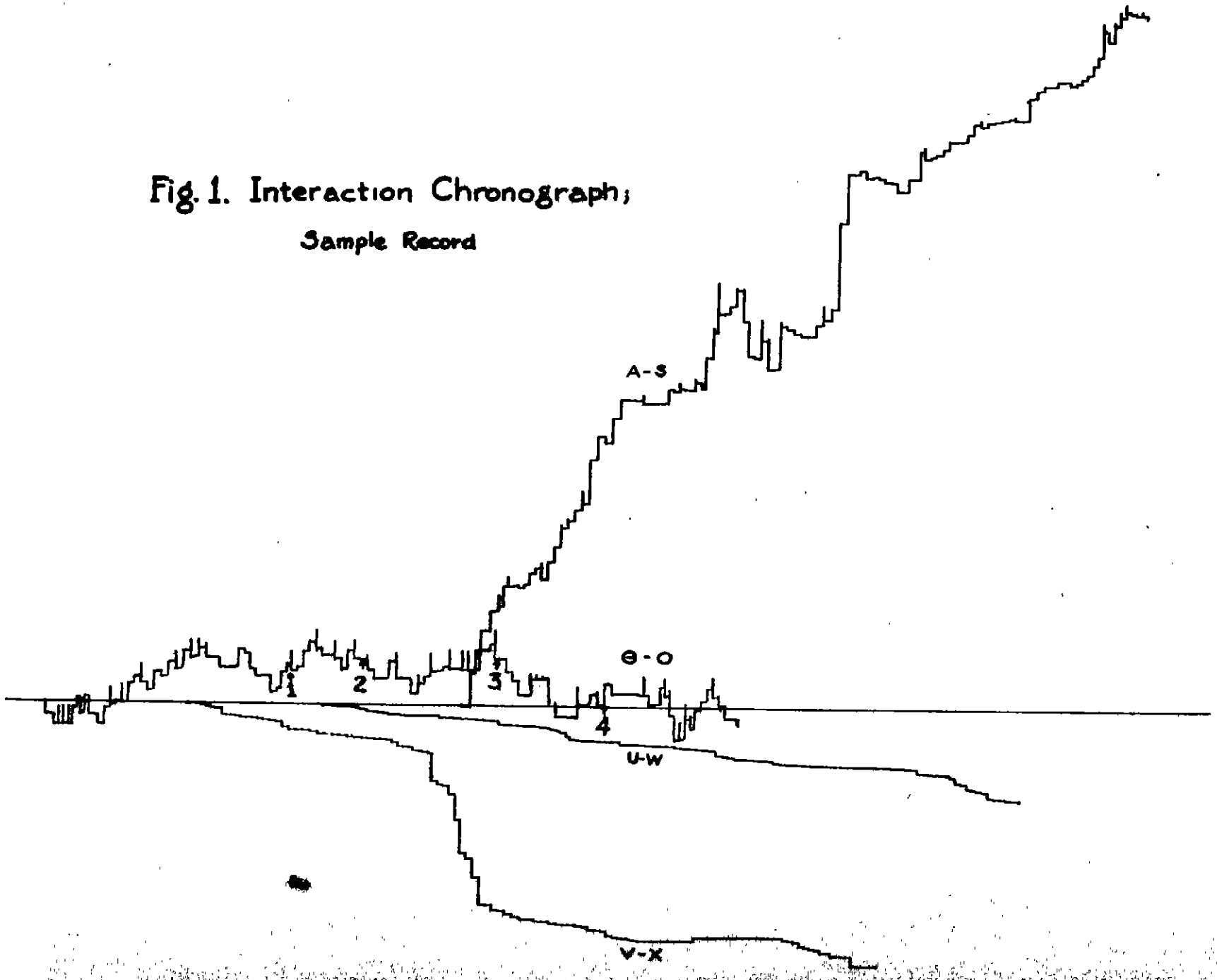
[11] In the early part of the observations, the A + S scriber had not been installed. A solenoid activated by the A key pushed a key on the old-style chronograph, marking the tape, which was read off directly by the use of its regular scale.

Fig. 1. Interaction Chronograph;

Sample Record



FIVE-WORD TEST

SUBJECT'S NAME_____ Date_____

SUBJECT'S NUMBER_____

SPECIAL IDENTIFICATION_____

No.	First Word	Second Word	Third Word	Fourth Word	Fifth Word
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

DICTIONARY

Personal References

The nominative singular, nominative plural, and possessive singular and forms of nouns and pronouns should be counted.

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acquaintance
amateur
artist
athlete

Babbitt
baby
banker
boss
boxer
boy

captain
character
child
Cinderella
citizen
clubman
commander
comrade
Conrad
convict
cosmopolite
couple
crowd

Dad
dancer
daughter
diver
dreamer

each
employer
everyone

farmer
father
fellow
fisherman
folks
friend

gentleman
girl
Grandma
group
guest
gymnast

he
helpmate
her
hers
herself
him
himself
his
host
husband

Jim
Johnson

King

laborer
lady
landowner
lover

male
man
Marie
master
me
militia
mine
miss
model
mother
Mrs. T.
my
myself

nude

officer
our
ours
ourself
ourselves
outcast

painter
pal
passenger
peasant
peon
people
pioneer
plowman
prostitute
pseudo-traveler

relative

sailor
Samurai
seaman
she
shipmate
shopgirl
shopper
sister
slave
soldier
someone
son
spectator
student
survivor
Swede

their
theirs
them
they
tumbler

us

we
wife
woman
worker
workingman
workman

you
your
yours
yourself
yourselves

ABSTRACTIONS

The nominative plural and possessive singular and plural forms of nouns should be counted, as well as the nominative singular forms.

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ability
acceptance
accomplishment
achievement
action
admiration
adolescence
adventure
advice
affair
affection
age
agony
agreeability
agreement
aloofness
ambition
Americanism
anguish
anniversary
anticipation
anxiety
apathy
appeal
appetite
apprehension
aridity
arrival
art
artistry
attempt
attention
attraction
award
awe
awkwardness

balance
bareness
barrenness
beauty
bestiality
bewilderment
birth
bleakness
boast
boredom
brawn
brightness
brotherhood
brutishness
build

calm
"camaraderie"
celebration
century
character
cheer
cheerfulness
childhood
class(es)
cleanliness
climax
closeness
coarseness
cold
coldness
comfort
companionship
comparison
compassion
complacency
composition
composure
comradeship
conceit
concentration
conception
concern
cordiality
conditions
condolence
confidence
conglomeration
congratulation
consolation
"consolance"
content
contentment
contrast
control
conversation
conviviality
coolness
cooperation
coordination
courage
"crowdiness"
culture

death
defeat
dejection
delineation
demonstration
dependence
depredation
depression
desire
desolation
despair
destitution
determination
detail
development
devotion
disappointment
disaster
discipline
disgust
disinterest
disproportion
dissipation
distress
diversion
domesticity
doubt
dream
dreamland
dreariness
drudgery
dryness
dullness
duty

eagerness
ease
education
effort
ego
elation
enmity
emotion (s)
emptiness
encouragement
endeavor
endurance
enjoyment
enthusiasm
envy
escape
excitement
exercise
exertion
exhaustion
existence
expectation
experience
expression

failure
faith
family
famine
farewell
fatigue
fear
feeling
felicity
fellowship
foolishness
force
foresight
forlorness
fortitude
fraternity
freedom
friendliness
friendship
frustration
fun
futility
future

ABSTRACTIONS

gaiety
gemütlichkeit
gentility
glee
glory
God
goodbye
goodfellowship
gossip
grace
grayness
grief
grimness
grit
guidance

happiness
hardiness
hardness
hardship
health
heartiness
help
helpfulness
home
homelife
homesickness
hominess
honor
hope
hopefulness
hopelessness
hospitality
humanity
humor
hunger
hurt

ideals
ignorance
illness
incredibility
indifference
indulgence
industry
intelligenc
innocence
instinct
instruction
interest
inversion
imagination
imbalance
immodesty
impatience
impossible
impression

jest
job
jollity
joviality
joy

knowledge

labor
lack
leadership
liberty
life
loneliness
look
loss
love
loyalty
luxury

masculinity
maternity
maturity
meditation
meeting
melancholy
memory
mercy
merriment
middle-age
mind
mirth
misery
mistake
mode
monotony
mood
motherhood
motherliness
motherlove

nonchalance
nothingness
nudity

occasion
old-age
optimism
outlet
orderliness
over-indulgence

pain
passion
passiveness
past
pathos
patience
peace
peacefulness
penance
pensiveness
pep
period
pessimism
plainness
plans
pleasantness
pleasure
plenty
poetry
poise
politics
posture
poverty
power
prayer
preoccupation
preparation
present
pride
privation
problem (s)
proportion
prosperity

quarrel
quietness

ABSTRACTIONS

rage
realism
reality
realization
recognition
reconciliation
regret
relation
relaxation
relentlessness
religion
reminiscence
rendezvous
repose
resignation
resignedness
respect
rest
retirement
return
reunion
reverie
riches
romance
rush
ruthlessness

sadness
satisfaction
scene
seamanship
section
security
self-concern
sensitivity
serenity
servitude
sex
shame
show
sickness
silence
simplicity
sincerity
skill
slumber
sleep
softness
solitude
sorrow
specimen
spirit
spite
sport
sportsmanship
stamina
starvation
stillness
stolidity
strain
strength
strife
struggle
study
sturdiness
success
surprise
suspicion
sweetness
sympathy

talent
task
taste
teamwork
tenderness
tenseness
tension
terror
thankfulness
thanks
thirst
thought
thoughtfulness
time
timidity
tiredness
toast
toil
torture
tragedy
trouble
twenties
type

"unbalance"
"uncomfort"
understanding
unhappiness
unity

value
variety
vastness
vengeance
victory
view
virtue

wages
wanderlust
warmth
waste
weakness
wealth
weariness
well-being
well-wishes
willingness
winning
wisdom
"wishfullness"
wistfullness
woe
womanhood
wonder
wonderment
work
worry
wrath
wrongdoings

youth

zest

DICTIONARY

Descriptive Adjectives

abject
abstract
accurate
adolescent
adrift
aesthetic
afloat
ageless
alcoholic
alone
ambitionless
ambitious
American
angry
anxious
apathetic
arid
aristocratic
artificial
artistic
arty
asea
asleep
athletic
attentive
authentic
average
awkward

backward
bad
bare
barren
beaten
beautiful
bedraggled
better
black
bleak
blond
bodily
Bohemian
boorish
bored
bossed
bourgeois
boyish
brawny
broken
brute
buffeted
burnt
busy

calm
carefree
careworn
caught
cheerful
citified
civilized
clad
classic
clean
clear
clenched
close
coarse
cold
colorful
comfortable
commercial
common
competitive
complete
cool
cooperative
confident
content
criminal
crowded
crude
curious
cynical

damp
dark
dated
deep
dejected
delicious
depressed
desolate
despondent
determined
developed
difficult
dirty
disappointed
discontented
discouraged
disinterested
dismal
dispirited
dissatisfied
distasteful
divine
domestic
downhearted
drab
dreamy
dreary
Dresden
dressed
drunk
dull
dumb
dusty

each
early
earthly
elderly
energetic
eventful
everyday
evil
exaggerated
excellent
even
exhausted
exotic
expectant
exposed

fair
faithful
fake
false
far-away
fat
festive
fine
finished
firm
flat
foodless
forced
foreign
forlorn
forsaken
frail
French
friendly
full
full-dress
funny
futile
future

gay
gentle
German
gloomy
gnarled
gone
good
graphic
great
Grecian
grim
grotesque

Descriptive Adjectives

haggard
half
happy
hard
healthy
hearty
heavy
hectic
high
homelike
homey
honored
hopeful
hopeless
hot
human
humble
humdrum
hungry
husband's

idle
ill-balanced
imaginative
important
impossible
impractical
impressionistic
Indian
indifferent
inferior
insecure
intense
intimate
intoxicated
irregular

Japanese
Johnson's
jolly
jovial
joyful
joyous
jubilant

kind
kind's
large
last
late
lifelike
life's
light
little
lonely
lonesome
long
lost
lovely
lower
lush

male
manly
man's
married
masculine
massive
maternal
mediocre
melancholy
mental
merry
mid-western
military
mixed
Mongolian
moody
morbid
morose
motionless
motley
motherly
mother's
muscular
mutual

naked
nautical
neat
next
nice
nineteenth
no
noisy
Norse
not
nourished
nude

obstinate
old
olden
elderly
one
open
ordinary
overcast
overstuffed
overworked
Oriental

pale
Parisian
passing
paternal
pathetic
peaceful
peculiar
pensive
perfect
phlegmatic
physical
picturesque
plain
pleasant
plentiful
poignant
poor
popular
posed
potential
prayerful
pretty
primitive
prone
proportioned
prosperous
proud
pure

quick
quiet

ragged
rambles
raw-boned
real
realistic
relaxed
reminiscent
repressive
resigned
respectful
restful
retired
rich
Roman
romantic
rough
round
rugged
rural
Russian

Descriptive Adjectives

sad
sailor's
salty
Samurai
sandy
satisfied
scolded
seasonal
secure
semi-nude
sensitive
sensuous
serious
shabby
shapely
shipwrecked
short
sick
simple
sincere
single
sisterly
sketchy
sleepy
sloppy
small
smelly
soft
solid
some
sordid
sorrowful
sorry
soulful
spacious
spiritual
statuesque
stern
stocky
stormy
strange
strenuous
strong
studied
stupid
sturdy
successful
surprised
surrealist
symmetrical

SCORE SHEET
PSYCHOLOGICAL TESTS

Subject's Name_____ Special identification_____

Subject's Number_____ Date_____

1. Thematic Picture Test.

Item	Score
A. Personal references:	
1. People	____
2. Men	____
3. Women	____
4. Wife or girl-friend	____
5. Couple or lovers	____
B. Feeling tone:	
1. Happy	____

2. Five-word Test.

Total number of words written____

Item	Number	Score
1 Personal references	____	____
2. Abstractions	____	____
3. Adjectives	____	____

3. Picture Arrangement Test.

Item	Picture	Rank Order	Score
1. Social class: lower	2	____	
	3	____	
	5	____	
	10	____	____
2. Sex: male	4	____	
	6	____	
	8	____	
	10	____	____
3. Sex: female	1	____	
	3	____	
	5	____	
	7	____	
	9	____	____
4. Females: middle-aged	1	____	
	8	____	
	9	____	____

Score_____

TESTS OF THE ABILITY TO TAKE IT

The hand-dynamometer and constant stimulus shocker tests are being studied. Verbal instructions for the tests follow exactly the instructions provided in the report by Dunlap and others.[15] The sequence in which the tests are administered is as follows:

a. Strength of grip -- preferred hand.
b. Strength of grip -- non-preferred hand.
c. Strength of grip -- preferred hand.
d. Strength of grip -- non-preferred hand.
e. Length of grip 60% of maximum -- preferred hand.
f. Constant stimulus shocker -- preferred hand.
(Ten-minute interval)
g. Constant stimulus shocker -- non-preferred hand.
h. Length of grip 60% of maximum -- non-preferred hand.

Treatment of Data. All the measures described in the original study will be taken. The two measures recommended in that study on the basis of reliability are the time score for the hand dynamometer and the terminal score for the constant stimulus shocker. Further analysis of the other measures and indices in relation to a pass-fail criterion, however, may be desirable.

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[15] Dunlap, J. W., et al., Tests of the "Ability to Take it." Washington, D. C.: Civil Aeronautics Administration Division of Research, Report No. 11. February, 1943.

"ABILITY TO TAKE IT" TESTS

Name:

Special Identification:

No:

Date:

Hand Dynamometer:

Preferred hand: ( )

Other hand:

Pull: 1.

2.

Pull: 1.

2.

Time:

Time:

Shocker:

Large: ( )

Small: ( )

Preferred hand: ( )

Other hand:

Threshold:

Painful:

Very painful:

Terminal:

Threshold:

Painful:

Very painful:

Terminal:

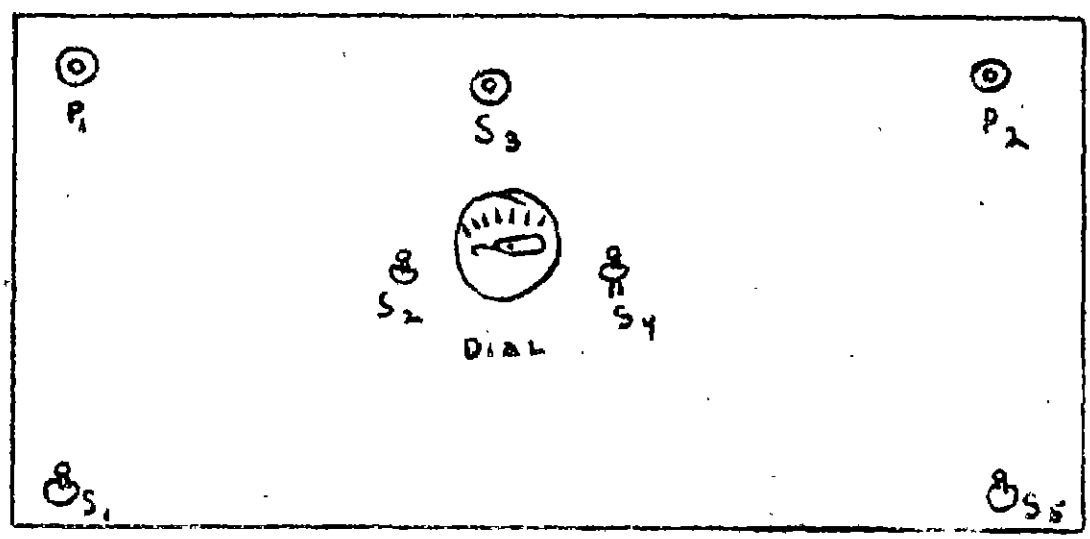
CONSTANT STIMULUS SHOCKER

Method of Operation

1. The battery should be checked just prior to using the stimulator. Press S_3 and read meter. It should register.
2. Turn S_4 down and S_5 up (off). S_5 up = load
3. Insert plug into wall socket, S_5 down = subject turn S_1 up (on), and <u>allow one minute for warm up</u>. (P_1 should light when S_1 is turned up.)
4. Set dial control to zero.
5. Turn S_4 up and with S_5 up, P_2 should glow as dial control is turned on. Return dial control to zero.
6. Push S_5 down. Select current range from S_2: up = minor, down = major.
7. With S_4 up, turn S_5 down.

The apparatus is now ready for testing. See accompanying instruction sheet for procedure.

8. Read the dial on the counter-clockwise edge of the rider.



CONSTANT STIMULUS SHOCKER

Instructions for Administration

(Instruments: shocker, 2 electrodes, 2 100-c.c. beakers, saturated salt solution)

Say: We wish to determine how much pain you can stand in terms of electric shock. You will place two fingers in the salt solution after which we will gradually increase the amount of electric shock. When you first place your fingers in the solution, there will be no sensation of shock or pain since the current will be cut off. As the current is increased, you will be asked to answer a series of four questions regarding your sensations. This test will gradually increase in painfulness until you cannot bear it, unless you have a lot of "guts." What we want to see is whether or not you can "take it." Remember that, although the test will become very painful, it will not hurt you permanently. Now may I see your right hand.

(Examiner carefully examines the index and middle fingers for cuts or hangnails. If none is apparent, immerse the fingers in the salt solution. If cuts or hangnails are apparent, select two fingers free from these imperfections. Have the assistant blindfold the subject.)

Say: I want you to tell me four things -- first, when you feel any sensation at all, second, when the sensation becomes painful -- by painful, I mean whatever you consider painful, third, I want you to tell me where the sensation becomes very painful but where you think you could stand some more if you had to; and fourth, you are to report where you can no longer take it. Then I will immediately cut off the current. Do not take your hand out of the solution until I tell you to do so. Now I am going to start the test.

(Examiner turns the rheostat control at the rate of one complete revolution every 60 seconds. He should have practiced this with a stop watch until he has an error of not more than 4 seconds.)

Say: Please tell me when you first feel sensation.

(No more comments should be made until the student reports sensation. If he reports sensation below 5 on the scale, stop the test. It means there is a minute cut on one of the fingers. Select another finger of the same hand and restart the test. When sensation is reported at a scale value of 5 or more, record this value.)

Say: Now I am going on and you report where it is painful.

(No comments until the student reports pain. Then record dial reading.)

Say: Now we are going on until you report the sensation is very painful but you think you can stand some more.

(No comments until the student reports very painful. Record dial reading.)

Say: Now we are going on until you cannot stand it any longer. Let us see if you can take it.

(No comments. As soon as subject says stop, cut the current by reversing the rheostat. After 10 minute interval or more, test the other hand.)

HAND DYNAMOMETER TEST

Instructions for Administration

Say:

This is a hand dynamometer for the measurement of strength of grip. We are interested in seeing just how strong your grip is as compared with your fellow man. Two trials for each hand is all that is required.

Keep the instrument away from your body. Adjust the handle to the point where you feel you can give your best performance. Squeeze as hard as you can for a moment before relaxing.

Examiner demonstrated by adjusting handle to his best position, places some magnesium carbonate on his hand so that the instrument does not slip; places dynamometer about six inches from body -- arm slightly bent with elbow also about six inches from body. Squeezes momentarily about as hard as he can.
Say:

You see how it is done. Now you try it.

Rubs chalk on subject's hands and sees that he assumes correct position. Say:

Measurements of the strength of grip of both hands are required. Are there any questions? Are you right handed or left handed?

First test with preferred hand. Say:

1. The right hand first please .....
2. The left hand .....
3. Right hand .....
4. Left hand .....

Measurements of maximum grip are recorded for both right and left hands as well as the reading of grip set. Say:

We are also interested in seeing how long you can hold the dynamometer above a certain point. I am going to place the indicator at that point.

Indicator is placed at 60 per cent of maximum grip -- for each hand respectively.

Hand Dynamometer Test (continued)

Say:

You are to squeeze the handle until the amber lights up. Do not squeeze too hard, for you just waste your strength. Keep the amber light glowing as long as you can. When your grip weakens, the red light will go on. The red light is a warning signal; therefore increase your grip so that the amber light is again on. When the red light goes on fight as long as you can to keep your grip from getting weaker. The buzzer sounding after the red light is the end of the test. Keep the dynamometer away from your body. Watch the lights. Try to keep your grip as steady as possible. Any questions? When I say go, start.....

Time is called off at five second intervals.
At finish of test, total time and grip set are recorded. Say:

After a ten minute rest, the endurance of your other hand will be tested.

After ten minutes proceed similarly with untested hand.

The shock test is administered between the fatigue tests for each hand.
