

ABSTRACT OF THESIS

CORRECTIVE AND OPTIONAL PROGRAMS
IN PHYSICAL EDUCATION AT COLORADO
AGRICULTURAL AND MECHANICAL COLLEGE

Submitted by
Vernon McHone

In partial fulfillment of the requirements
for the Degree of Master of Education
Colorado
Agricultural and Mechanical College
Fort Collins, Colorado

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ABSTRACT

The results from the draft statistics of World War II gave a very morbid picture of the physical status of American citizens. Musculo-skeletal deficiencies and cardiovascular weaknesses or malfunctions were among causes of the greatest number of rejections. This evidence points out the dire need for the inclusion of a program of corrective procedures to be applied to individuals with weakness.

Many writers in the field of physical education have stressed the need for a program of correction for the physically deficient. Various means of evaluation of the physical fitness of individuals have been designed. Special exercises for the correction of physical disabilities have been devised. Only one report has been found of such a program of individual correctives exercises combined with the physical education class in general and the evaluation of that program. The problem, then, is two-fold.

Problem

Is it feasible and desirable to combine a corrective program with a general program of physical activity?

Problem analysis.--In order to answer the above problem, the following questions were considered:

1. How can the handicapped individual be included in the physical education program?

2. In what areas of physical status should appraisal be made?

3. How can desired alterations in status be accomplished?

4. How can alterations of status in these areas be appraised?

5. Does satisfactory improvement result for both normal and sub-normal students?

Delimitations.--This problem was limited to the following:

1. One hundred, thirty-six men students enrolled in physical education at Colorado Agricultural and Mechanical College during the school year of 1945-46.

2. The program and methods of measurement are set up by the Department of Physical Education at Colorado Agricultural and Mechanical College.

3. Analysis of the results of an individual program of exercises as appraised by the above-mentioned methods of measurement.

Methods and materials

In order to obtain data for this study, the records of the test scores of students enrolled in physical education classes at Colorado Agricultural and Mechanical

College for the school year, 1945-46, were consulted. The medical examination records from the College Health Service and personal observation of postural deficiencies were noted.

Testing program.--A battery of seven tests was administered to all men students enrolled in physical education at the beginning of the winter quarter.

The following test items and the areas the tests purported to measure are presented:

1. Standing Broad Jump, a test designed to measure the explosive power and the strength of the leg extensors.
2. Dipping, a test designed to measure the extensor strength of the arms and shoulders.
3. Block Transfer, a test designed to measure the hand and eye coordination.
4. Dodge Run, a test designed to measure agility and speed of the legs.
5. Arm and Leg Speed, a test designed to measure the speed of the arms and legs.
6. Medicine Ball Throw, a test designed to measure the strength of the back and shoulder girdle extensors and general body coordination.
7. 175-Yard Run, a test designed to measure speed and endurance.

Those in the individual exercise groups were given programs of exercises directed toward correction of the handicap or improvement in the weak areas. Those

individuals in the optional group were permitted to participate in any or all of the following activities, as they chose: handball, basketball, badminton, volleyball, tennis, cage ball, touch football, wrestling, track events, swimming, and weight lifting.

At the end of the quarter the students were re-tested and were graded according to the results.

Analysis of data

Through the analysis of the screening test, it was found that there were 39 individuals who showed need for development in definite areas. There were 97 individuals who participated in the activity program.

In order to determine the value of specialized programs for handicapped students, it was necessary to compare each individual's improvement with the average improvement of the optional group. This procedure made it possible to analyze each case separately and to draw conclusions which would indicate the benefit derived from the remedial program.

Summary.--From the analysis of the entire group of corrective exercises the following was found to prevail:

1. Eleven of the individuals showed an increase in all the areas in which special correction was directed.

2. Six of the individuals participating in a part correction and part optional program showed a decrease in the scores in the events toward which the optional exercises were directed.

3. Eight of the individuals showed no improvement in the areas toward which corrective exercises were administered.

4. Average improvement in the corrective group was greater than that of the optional group in the following test items: medicine ball throw, block transfer, dodge run, and endurance.

Summary

The inclusion of the physically deficient individual into the general physical education class has been accomplished through the prescription and supervision of individual exercise programs directed toward the amelioration of a particular handicap or weakness.

The areas of physical status were defined and methods of evaluation of these areas were established by the Physical Education Department at Colorado Agricultural and Mechanical College.

Through a series of periodic evaluations during the quarter the progress made by the various groups was noted. The corrective or remedial group was evaluated at frequent intervals during the quarter. The optional group was evaluated only at the beginning and end of the quarter. Comparisons were made between the results obtained by the two groups on the first or screening test and the final or follow-up test.

The conclusions drawn from these comparisons indicate that individual exercise programs have specific

value in the following areas: strength of the back and shoulder girdle, hand and eye coordination, agility, and endurance, providing that a satisfactory attitude toward the program can be achieved. The recreational group through their program of activity showed marked improvement in the areas of explosive power of the legs and arm strength. The results of the speed test showed very little difference between the two groups. Average improvement in all areas was satisfactory in both groups.

Therefore, it may be concluded that a combination of an optional and an individual exercise program is feasible and yields valuable results for all participants.

Recommendations for further study

1. A statistical analysis of the results of a prescriptive program of exercises applied to individuals with weak musculature but without medical handicaps. This should be compared with the progress of control group of similar composition taking an optional program. Such a study should be continued over a period of time sufficient to afford opportunity for variation in type of prescriptive exercises for the various areas of weakness.

2. A statistical analysis should be made of the relationship of age, height, weight, and possibly other factors to scores on the seven tests presented in this study.

3. Research is needed on the development of valid standards for measuring the individual physical progress of sub-normal cases.

T H E S I S

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SUPERVISION BY VERNON McHONE
ENTITLED CORRECTIVE AND OPTIONAL PROGRAMS IN PHYSICAL
EDUCATION AT COLORADO AGRICULTURAL AND
MECHANICAL COLLEGE
BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF EDUCATION
MAJORING IN PHYSICAL EDUCATION
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must be obtained from the Dean of the Graduate School.

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Chapter I

INTRODUCTION

Physical education, in recent years, has come to be of more importance in the school curriculum. The national, state, county, and city administrators, school officials, and parents have realized the importance of a well-rounded program of education. Education has been altered to include the physical aspect of the pupil as well as his mental processes. Physical education prior to this time was primarily for the masses, and those individuals suffering from handicaps were eliminated because of their inability to participate in the programs. This change of attitude in physical education has been a tedious process. World conflict has aided in the importance of the additional stress on the physical education inclusion in the school curriculum.

Recognition of the state's responsibility for educational training of handicapped children led President Hoover, in 1931, to call a White House Conference for consideration of the problem involved. For purpose of classification, this conference defined a crippled child in the following terms:

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The crippled child in the orthopedic sense, is a child that has a defect which causes a deformity or an interference with normal functioning of the bones, muscles or joints. His condition may be congenital or may be due to disease or accident. It may be aggravated by disease, by neglect, or by accident. (33:299)

Results from the draft statistics for military service in the past world conflict gave a very morbid picture of the physical status of American citizens. Rountree and others (26) analyzed the causes of rejections as noted by the selective service examination for the Army of 45,485 men in the 18- and 19-year-old age group. This is not necessarily indicative of all men entering the Army for this age group. The group was composed of 42,273 white males and 3,312 Negro males. Examinations were given during December, 1942, and January and February, 1943. The average rejections were 25 per cent, which was broken down into 23.8 per cent of the whites and 45.5 per cent of the Negroes. The following is a list of the noted defects:

Table 1.--CAUSES OF DRAFT REJECTIONS, WORLD WAR II.

Cause of rejection	Number rejected per 1,000
Eyes	44.9
Mental diseases	27.6
Musculo-skeletal deficiencies	22.7
Cardiovascular weakness or malfunction	21.4
Educational deficiencies	19.5
Hernia and relaxed inguinal rings	16.3
Defects of the ears	15.0
Neurologic defects	14.8
Syphilis	10.2
Underweight	7.1
Tuberculosis	6.8
(26:181)	

It might be noted here that musculo-skeletal deficiencies and cardiovascular weaknesses or malfunctions are among the highest rejected. Since development in these areas may be accomplished through properly supervised physical activity, the need for enlargement and improvement of current physical education programs is definitely indicated.

With so many men returning handicapped from the war, all possible agencies for correction must be utilized. Location of the many Rehabilitation Centers on college campuses and in towns throughout the United States points out the recognition of this need by federal and state authorities.

Poliomyelitis has definitely become a problem for Colorado. In the past few years, the disease has become more prevalent, leaving many individuals handicapped. With the growing use of the Kenney Treatment, much has been done in the relief of ill effects from the disease. This treatment in itself is a form of individual physical correction.

A quotation from the Educational Policies Commission (22) entitled "Education and the Morale of Free People" sets forth a new approach to the necessity for individual exercises:

It may be stated as a general principle that individual morale and the morale of the group reflect the physical well-being of the members of the group. A person whose energies are curtailed by chronic infection, a person

suffering from malnutrition, a person who is constantly on the edge of collapse from fatigue will rarely possess a satisfactory degree of morale. On the other hand, a rugged and buoyant health assists its possessor to rise above petty annoyances and even above supreme difficulties and confront the world with confidence and courage. (22:44)

Need for study

It is apparent from the above that the school must accept some of the responsibility for assisting the handicapped individual in his efforts to establish himself usefully as a member of society. This responsibility applies to his physical as well as to his mental status. Many writers in the field of physical education have stressed the need for a program of correction for the physically deficient. Special exercises for the correction of physical disabilities have been devised. The writer has been able to find only one report of such a combined program instituted and carried out. The problem, then, is two-fold.

The problem

Is it feasible and desirable to combine a corrective program with a general program of physical activity?

Problem analysis.--In order to answer the above problem, the following will be considered:

1. How can the handicapped individual be included in the physical education program?

2. In what areas of physical status should appraisal be made?

3. How can desired alterations in status be accomplished?

4. How can alterations of status in these areas be appraised?

5. Does satisfactory improvement result for both normal and subnormal students?

Delimitations.--This problem will be limited to the following:

1. One hundred and thirty-six men students enrolled in physical education at Colorado Agricultural and Mechanical College during the school year of 1945-46.

2. The program and methods of measurement are set up by the Department of Physical Education at Colorado Agricultural and Mechanical College.

3. Analysis of the results of an individual program of exercises as appraised by the above methods of measurement.

Chapter II

REVIEW OF LITERATURE

In reviewing material pertaining to the problem of the inclusion of the physically handicapped individual into the class of physical exercise, the measurement of his progress through a battery of physical proficiency tests, and individual exercise programs to alleviate those handicaps, few studies were found. Many writers recognized the dire need of the inclusion of the physically deficient individual into the class of physical education; various tests have been devised for measurement of physical fitness, and some programs of individual exercises have been developed. But, so far as available materials are concerned, only one writer has prescribed individual exercises to the handicapped and has noted the progress made by that group of individuals.

The Committee on the Physically and Mentally Handicapped, of the White House Conference on Child Health and Protection, 1931, formulated resolutions for future activities of this group for the guidance of the educational administrator. The report stated:

The handicapped child has a right:

1. To as vigorous a body as human skill can give him.

2. To an education so adapted to his handicap that he can be economically independent and have the chance for the fullest life of which he is capable.

3. To be brought up and educated by those who understand the nature of the burden he has to bear and to consider it a privilege to help him bear it.

4. To grow up in a world which does not set him apart, which looks at him not with scorn or pity or ridicule but which welcomes him exactly as it welcomes every child, which offers him identical privileges and identical responsibilities.

5. To a life on which his handicap casts no shadow, but which is filled day by day with those things which make it worth while, with comradeship, love, work, play, laughter, and tears--a life in which these things bring continually increasing growth, richness, release of energies, joy in achievement. (33:291)

Terman (29), 1929, stated: "Modern educational principles indicate a greater significance being attached to the health examination and the correction of remedial defects." (29:232) His view on this is that public clinics should be established for the correction of such defects. He seems to feel that the correction should be accomplished outside of the curriculum.

Bentley (3), 1936, took the opposite view. He expressed his attitude as follows:

Remedial features must be stressed in the school curriculum. Often they are interpreted as being recreational in scope and aim, serving the purpose of reformation of habits and activity. Manifestly, care should be extended conscientiously to the crippled child along physically recuperative and rehabilitative lines by duly qualified teachers. All training should be individually applied wherever possible and conform to the

needs of the individual case guided by the advice of a competent medical advisor. (3:31)

Rathbone (24), 1939, said:

Correctives is not a narrow field; it is as wide as anyone cares to make it. It must consider the health problems of the weak child, so as to help him develop as normally as possible; and it must consider the hazards of the athlete, so as to protect him from injury or strain. (24:292)

She indicated here that it is just as important to develop the physique of the weak individual as it is to correct the defects of the physically malformed.

MacLaren's (14:125), 1885, main concern with physical education was in the achievement of health, strength, and symmetrical development. He saw remedial exercise to be of value only to the extent that it corrects faulty development. During this period of history the main concern with physical activity was the livelihood of the individual to be able to ward off danger that might occur from the Indians and to obtain a living for him and his family through hunting and fishing.

Stafford (28:321), 1930, seemed to consider preventive and corrective programs a separate function of physical education. He drew a dividing line between the normal and the subnormal, setting up entirely different objectives for the subnormal group. The preventive program should be administered to the child early in his school life. The results from that program will show its improvement in the physical education classes in higher

education. These classes will be made up of normal individuals with very little correction needed.

Moss and Orion (19:435), 1939, in outlining a physical education program, emphasized that classes in modified activity, correctives, or rest should be held for those who need them. Individual programs should be formulated under a physician's recommendation and carried out by teachers with specialized training in correctives.

Gallagher and Brouha (9), 1944, who have been carrying on research at Harvard under the Grant Study, remarked that among other developments needed are ". . . widespread examinations leading to the early correction of orthopedic disorders, hernia, nose and throat conditions, dental and visual defects. . . ." (9:824) However, their idea is that such cases should be referred to medical agencies. No provision is made in their study for the inclusion of a corrective program in the physical education class.

The proposed physical education law of New Jersey (32) includes the requirement that ". . . any functional or physical defects shall be corrected, remedied or ameliorated, and a pupil shall not be graduated unless such defects have been corrected or ameliorated." (32:252) It is the belief of the writer that there are certain defects present in some individuals which can be corrected only by medical attention.

According to Ellis (23), 1934:

A majority of physically and mentally handicapped children possess aptitudes and abilities which, when developed by proper social, academic, and vocational training, can make these children socially and economically independent. To every child we owe the opportunity to develop to the maximum of his capacity. It is our particular duty to see that physically and mentally handicapped children have this opportunity, as a matter of right and fair play in order to conserve human resources and to afford protection against dependency, pauperism, frustration, and delinquency. The waste of ability involved in our present laissez faire policy warrants our putting forth every effort in behalf of physically and mentally handicapped children, and demands that we supply such facilities that they may have a thorough preparation for community life. (23:353)

McCloy (17), 1938, supported the position of strength as essential to physical fitness:

Each individual is required to carry or support his bodily weight from morning to night. He must do this with the musculature he has. It is known that a muscle that is too weak for its task works at a lower efficiency than does one that is adequately developed. Hence, an individual who is markedly under-developed is working inefficiently, so far as his muscles are concerned, and is suffering greater fatigue, both locally and generally. He has less energy with which to approach his tasks, suffers more from fatigue toxemia, and works under a greater nervous strain. Hence, in addition to its indications as to general medical condition, the strength tests in the forms of the PFI tell much about the individual's general fitness for living and working. (17:60)

Brock and others (4), 1941, have denominated their concept of physical fitness as Motor Fitness.

Motor fitness is a complex. A number of factors enter into efficient performance whether it be mainly of strength, speed, endurance, or skill. There is not one thing alone, but the

body type of structure, the chemistry, the organic functioning, the mechanics, and the emotional state, can all be considered as composing the elements that make for fitness in motor or skill performance. It is a Gestalt, resulting in the control of all factors of strength and speed and endurance by complex psychic factors. The psychic factors culminate in what may be designated as "attitude" determining finally the excellence or lack of excellence in a performance. Emotional states of desire or purpose, primitive instinct (fear and love) may motivate to a higher or lower performance. It is the whole personality dynamically organized that results in motor fitness. Motor fitness is making the most of our constitutional make-up for structural, physiological, cognitive, affective, and conative natures. (4:407)

Scott (27), 1945, enumerated three guiding principles for application to the problems of applied kinesiology. These three principles are:

1. All tissues of the body show a definite relationship between structure and function, adaptations being made to functional demands both normal and pathological.

2. Human motion occurs in accordance with general mechanical laws, as is evidenced by the structure and functioning of the motor system.

3. The individual can perform an endless variety of movements and can develop a type of motor functioning the economy and perfection of which is dependent upon the adequacy of the organism to meet these kinetic demands, and upon a complex adjustment of all phases of the performance. These phases include innervation, chemical and mechanical processes of muscle contraction, association of muscles, and application of mechanical laws. (27:9)

McCloy (16), 1940, stated that the items that are fundamental to learning and skill accomplishment are muscular strength, dynamic energy, ability to change direction, flexibility, agility, peripheral vision, good vision, con-

centration, understanding of the mechanics of the techniques of the activities, and absence of disturbance or inhibiting emotional influences. He summarized specific factors in motor educability as insight into the nature of skill; ability to visualize special relations; the ability to make quick and adaptive decisions; sensory-motor coordination of eye to head, hand to foot; sensory-motor coordinations related to weight and force; judgments of the relationship of the subject to external objects in relation to time, distance, direction; accuracy of direction and small angle of error; general kinesthetic sensitivity and control; ability to coordinate a complex series or combinations of movements which follow one another in rapid succession; arm control; factors involved in the function of balance; timing, motor rhythm, esthetic feeling, sensory rhythm (16:28). He indicated that a number of these are related.

Definitions of general motor ability are all patterned more or less after that formulated by the special committee appointed in 1926 of the American Physical Education Association (1). That definition is as follows:

Motor ability is that ability in the manipulation of the body which is more or less general, which is more or less inherent, and which permits an individual to learn motor skills easily, and to become readily proficient in them.
(1:399)

Clarke (6:222), 1945, formulated his conception of what is needed in a testing program. His idea was that not only is a test needed for evaluating the physical fit-

ness benefits of the total physical education program, but such a test is also needed to select boys and girls who are deficient in the essential quality, so that their particular needs may be studied and improved. Re-testing from time to time will also mark the change that these individuals are making.

In 1925, Rogers (25:43) standardized testing procedures and developed norm tables for their interpretation, so that the relationship between physical condition, athletic performance, and muscular strength was demonstrated. In selecting the individual elements composing the Physical Fitness Index Battery, Rogers tried to include only tests that would measure most of the large muscles of the body. The complete test involves the following muscle groups: forearm, upper arm, shoulder girdles, back, and legs. The Strength Index is the gross score obtained from the six strength tests plus the lung capacity. The Physical Fitness Index is a score derived from comparing an achieved Strength Index with norms based upon the individual's sex, weight, and age. A Physical Fitness Index of 100 is average. The tests included are as follows: age, height, and weight; lung capacity; strength of grip; strength of back and legs; and strength of arms. Arm strength was calculated according to the following formula:

$$(\text{pull-ups} + \text{push-ups}) \times \frac{W}{10} + H - 60$$

in which W represents the weight in pounds, and H is the height in inches. Fractions are corrected to whole numbers. (25:44)

One of the outstanding tests of general athletic ability for college men was published in 1939 by Cozens (7). In order to obtain a composite idea of the elements that comprise general athletic ability, Cozens secured judgments from 52 representative physical educators, and selected the seven deemed most important by the judges. Over 40 possible tests were collected and classified under the seven elements previously chosen, one test for each element being retained after experimentation. These elements and tests appear in the following Table 2.

Table 2.--ELEMENTS AND TEST ITEMS COMPRISING THE COZEN'S TEST OF GENERAL ATHLETIC ABILITY FOR COLLEGE MEN (Table II, 7:45).

Test elements	Test items	Score Multi- plication
1. Arm and shoulder girdle strength	Dips	0.8
2. Arm and shoulder girdle coordination	Basketball throw for distance	1.9
3. Hand-eye, foot-eye coordination	Football punt for distance	1.0
4. Jumping strength, leg strength, and leg flexibility	Standing broad jump	0.9
5. Endurance	300 yard run	1.3
6. Body coordination, agility and control.	Bar snap for distance	0.5
7. Speed of legs	Dodge run	1.0

In scoring this test, the raw scores are transposed into

sigma scores, and these are multiplied by the weights given in Table 2 to obtain the relative value that each test item contributes to the general quality of athletic ability. He stated that the validity and reliability of the tests is high.

McCloy (17), 1942, also constructed a test of general motor ability that contains certain elements quite different from those included in the Strength Index but designed to accomplish the same results; that is, to measure the "developed capacity of an individual for participation in a wide range of physical activities." (17:292) The strength test included is the pull-up or chinning test computed for arm strength, using McCloy's formula. That formula is as follows:

$$\text{Chin and dip} = .808 \text{ push-ups and pull-ups} + 221. \quad (17:294)$$

The track and field events may vary according to the age and experience of the group, provided scoring tables are available for the event. However, the events selected should include one sprint (varying from 50 to 100 yards), one broad jump (either running or standing), the running high jump, and a weight throwing event (shot put, basketball throw, or baseball throw). These four events should be scored by McCloy's scoring tables, the sum of which is combined by special formula with chinning strength, as follows:

$$\begin{aligned} \text{General Motor Ability Score} &= .1022 \text{ (track and field points)} \\ &+ .3928 \text{ (chinning strength)} \end{aligned}$$

Clarke (6), 1945, formulated his views, the resultant of a program of evaluation as follows:

Individuals differ in their mental, physical, and social make-ups. Some have great intelligence and learn quickly, while others are slow in their mental processes and have difficulty in keeping up with school work; some are alive physically, while others are weak and unfit; some are capable of being great athletes, while others will always be mediocre and below average; some get along well with people and are liked and respected by their peers, while others are obnoxious and unsportsmanlike in their social relationships; and still others learn physical skills with great facility, while others will probably always be a bit awkward and clumsy at sports and games. The new emphasis adapts the educational program to the individual's capacities and needs - and necessarily at those capacities and needs which have been determined by examinations, tests, and analyses by teachers. Procedures necessary for adapting physical education programs to the capabilities of boys and girls and to meeting their individual social adjustment, homogeneous grouping, and sports and athletic activities. (6:321)

Scott (27), 1945, expressed her views on the physiological foundation for the prescription and directed exercises toward the physically or handicapped individual. It might be noted that she included the weak individual in the same category with the handicapped. Her views were as follows:

All tissues of the body develop and their capacity functioning increases through proper use. It is a well known fact that a muscle which is not used as the result of injury to the nerve, or even those involved when a joint is immobilized for a short time, will become flaccid and weak and lose much of the contractile power. Likewise, a muscle which is used regularly exhibits a healthy state of tonus, becomes firm, and may even increase in external measurement as well as in the maximum force which it can produce. The same evidence of

capacity for work is shown in an active individual by improvement of all body functions. (27:350)

Certain objectives for corrective and remedial physical education have been expressed by Stafford (28), 1930. These objectives are:

1. The restoration of the weak and under-exercised individual to the point where he can indulge with benefit and pleasure in the various recreational activities of the gymnasium and the athletic field.

2. The re-education of muscular systems which have become weakened through disuse, paralysis, and injury.

3. The development of the power of normal movements.

4. The restoration of function of disabled parts. (Nothing surpasses exercise in this respect.)

5. The improvement of neuromuscular coordination.

6. The increase of mobility (within safe limits).

7. The provision of opportunities for exercise which will not be injurious to the individual and which will be within his needs and capacity. (28:9)

8. The training of the individual in "safe" exercises and games which can be used for years to come (carry-over). (28:9)

Murphy (20), in 1946, conducted a similar study to that of the writer's, in which he used a battery of tests to measure the improvement of an individual exercise program for the classification of students, improvement made by the recreational group, improvement made by the corrective group, using averages made by those groups. His

test battery included the following:

1. Standing Broad Jump--measure of leg strength specifically, the springing strength of the extensors of the leg plus flexion ability of the ankle and strength of the flexors of the foot.

2. Arm and Leg Speed--the hand slap, which is purely a test of speed of arm movement; and the foot slap, which measures the speed of leg movement.

- (a.) A barrier is constructed twelve inches high and three feet long. The subject kneels or sits at one end of the barrier with the hand he wishes to use on the floor on the corresponding side of the barrier. He should take a position from which he can raise his hand over the barrier and slap the floor on the opposite side with maximum speed and minimum effort.

- (b.) The subject stands at one end of the barrier with either foot on the floor on the corresponding side of the barrier. He should stand so that he can raise his foot over the barrier and slap the floor on the opposite side with maximum speed and minimum effort. He may balance himself by grasping any support with either or both hands. The contestant must slap the floor ten times for each of the tests. Time is recorded in tenth of seconds. (20:29)

3. Arm endurance is the push-up test on the parallel bars.

4. Block transfer test is the same used by the writer.

The averages noted in Murphy's paper were as follows:

Standing broad jump, seven feet, three inches; Dipping, six and one-half dips; Arm speed, five and seven-tenths seconds; Leg speed, seven and nine-tenths seconds; and

Block transfer, 19.4 seconds. Each of the individual cases was treated separately as to the progress made after each testing.

Murphy's test battery included the evaluation of the following areas: Arm speed, leg speed, hand-eye coordination, endurance of the arms, and strength of the legs. It is the belief of the writer that other areas should be included in a battery of tests to measure the physical status of an individual. Certainly agility, endurance of the legs, and strength of the back and shoulder girdle muscles should be included with the above areas for a more rounded evaluation of the physical status (20:29).

Terman (29), Rathbone (24), Stafford (28), and Gallagher and Brouha (9) have expressed the necessity for a program of individual correction of the physically weak individual in the present educational systems.

Various means of evaluation of the physical fitness of individual have been designed by McCloy (17), Cozens (7), and Rogers (25).

McCloy (17) and Brock (4) have designated various areas pertinent to a well-rounded system of evaluation.

Measurements of the progress made by the physically deficient individual have been stressed by Clarke (6) and Scott (27). They stressed the importance of the measurement needed to note progress by the handicapped. No definite test batteries have been devised by these two writers for the evaluation.

It is the belief of the writer that the physical ability or physical progress of an individual should be

measured objectively by a battery of tests including the more essential areas of physical activity. Many writers have realized the necessity for doing something for the physically deficient, or physically weak individual. Some writers have devised various tests to measure the ability of individuals in physical exertions. One writer has analyzed the results obtained from a battery of tests applied to students taking a program of corrective individualized exercises.

Chapter III

COLLECTION OF DATA

This study is an appraisal of the results of the physical education program for the men students at Colorado Agricultural and Mechanical College for the school year of 1945-46. This program was designed to put into effect the principles and to accomplish the objectives set up in the previous chapter. A general program of activity for the maintenance of adequate motor fitness and the teaching of desirable recreational skills was set up for normal and superior students. At the same time, those of weak musculature or of low ability in particular areas, together with those physically handicapped by injury or disease, were put on a program individually prescribed for them. It was anticipated that the program would prove to be beneficial to all participants. Methods of measuring status and progress were set up. Analysis of results should go far toward solving the problem of this thesis.

In order to obtain data for this study, the records of the test scores of students enrolled in physical education classes at Colorado Agricultural and Mechanical College for the school year of 1945-46 were consulted. The medical examination records from the College Health Service

and personal observation of postural deficiencies were noted. Those students with cardiac abnormalities were given programs suggested by the medical staff at the College Health Service.

Testing program

A battery of seven tests was administered to all men students enrolled in physical education at the beginning of the quarter. Those tests included measurement of strength and explosive power of the legs, strength of the back and shoulder girdle, arm strength, hand and eye coordination, agility, speed, and endurance. From the results of the first test, averages were determined for each of the tests in the battery. From these averages, point scores were calculated by using the T-score formula. Individual profiles were used for the purpose of classification of the individuals into the groups necessary. Students who were above average on the tests and those individuals whose profiles showed them fairly consistent in all areas of measurement were classified in the activity group or normal group. Those individuals whose profiles showed them to be below average in some of the tests and above average on others and those below average on all tests were grouped into the corrective exercise group.

In the following paragraphs the test items are described in detail:

(1) Standing Broad Jump

This test is designed to measure the strength and explosive power of the leg extensors.

Equipment: Measuring tape and mats.

Construction: Mats must be marked with a take-off line.

Administration: The contestant is allowed one practice jump. He stands with his feet together behind the take-off line. He springs forward and is measured to the closest inch at the distance nearest the take-off line.

Restriction: The contestant is allowed only three trials, the furthest being counted for score. He is not allowed to take-off in front of the take-off line. He must jump from both feet at the same time.

(2) Dipping

This test is designed to measure the extensor strength of the arms and shoulders.

Equipment: Parallel bars.

Construction: None.

Administration: The starting position is that with arms extended with body erect resting on the parallel bars. The arms are then flexed to the fullest, then extended fully. This constitutes one dip. The process is continued until the contestant cannot do another dip.

Restrictions: The contestant is not allowed to rest between dips. After he starts dipping he must continue.

No half scores are recorded. The arms must be fully flexed and extended.

(3) Block Transfer

This test is designed to measure the hand and eye coordination.

Equipment: Stop watch and 10 wooden blocks 2 by 2 by 2 inches.

Construction: Two circles with nine-inch radii are drawn or painted on the floor with their centers eight feet apart. Midway between them and perpendicular to their common axis a straight line approximately three feet long is drawn a center line.

Administration: In one circle the 10 cubes are placed. The blocks may be arranged in any pattern the subject prefers and in either circle preferred so long as all the blocks are within the circle. The subject's starting position is a standing or crouched position with both feet on the floor opposite the center line in the circle of which the blocks are located. At the starting signal, the stop watch is started and the subject moves across the center line with both feet to pick up one of the cubes. He then moves back across the center line to deposit the cube in the opposite circle. Immediately he returns across the center line to get another cube, which in turn he carries across the center line and deposits as he did the previous block. This process is continued until all of the

10 cubes are within the opposite circle of which the test was started. The stop watch is stopped when all of the blocks are in the opposite circle.

Restrictions: Only one cube may be moved at a time. Both feet must touch the floor on the proper side of the center line in moving from one circle to the other. All cubes must be within the circle when the test is started. All cubes must be within the circle when the stop watch is stopped. Practice is allowed.

(4) Dodge Run

This test is designed to measure agility and speed of the legs.

Equipment: Stop watch and gymnasium floor with basketball court design.

Construction: Free throw lanes and center line on the basketball court.

Administration: The starting position is that of a track start outside of the out-of-bounds line underneath the basket on a basketball court. The stop watch is started after the starting signal is given. The subject proceeds down the free throw lane to the center line, right turn to the out-of-bounds line or side line outside that line, a complete left turn, across the floor on the opposite side of the center line, outside of the out-of-bounds line or side line, a complete left turn, back to the center of the floor, a right turn down the free throw

lane, finishing as the contestant crosses the out-of-bounds line under the basket.

Restrictions: The contestant is not allowed to cross over the lines or to step on the lines. He may not step out of the lanes prescribed for him. He may not jump the gun.

(5) Arm and Leg Speed

This test is designed to measure the speed of the arms and the legs.

Equipment: Stop watch and constructed platform.

Construction: Platform is constructed of four 4 by 4 inches, 6 feet long planks, used as uprights. Two planks 2 by 12 inches, 12 feet long, are used as barriers. The center of the upper plank is 5 feet from the floor, the center of the lower plank being 10 inches from the floor. The inner surfaces of the planks are covered with kapok covered with canvas.

Administration: For the arm speed test the subject stands facing one of the barriers with either hand touching the barrier to his rear. At the starting signal he moves his hand forward to touch the front barrier, then reverses to touch the rear barrier, continuing this movement as rapidly as possible until he has touched the front barrier 10 times. The elapsed time in 10ths of seconds constitutes his score.

For the leg speed test the contestant assumes the position as in the arm speed test with the exception that one foot is touching the barrier to his rear.

The scores of the two speed tests are added together to determine the combined speed of the arms and the legs.

Restrictions: The contestant must touch the opposite barrier 10 times. He may not start before the starting signal is given. Practice is allowed prior to the testing. Either arm or leg may be used in the test.

(6) Medicine Ball Throw Backward

This test is designed to measure the strength of the back and shoulder girdle extensors and the general body coordination.

Equipment: Tape measure and a 12-pound medicine ball.

Construction: None.

Administration: The subject stands with the heels on the throwing line. His back is facing the throwing area. The medicine ball is grasped with both hands and thrown over the head backward. Three trials are allowed, the furthest being counted for the score of the test.

Restrictions: The medicine ball must be thrown over the head backwards. The participant must not step over the throwing line while in the process of throwing or while the medicine ball is in flight. Practice is allowed

prior to testing.

(7) 175-Yard Run

This test is designed to measure speed and endurance.

Equipment: Stop watch and a track or area of 175 yards in length.

Construction: None.

Administration: The contestant starts from the starting line with a track start. Time is taken for him from the starting line until he crosses the finish line.

Restrictions: He may not start before the starting signal is given. He must stay within the lanes prescribed for him.

Those students whose scores were significantly below the average of the entire group were given programs of individual exercises concentrated upon the areas of the body in which the weakness was apparent. Some of the students were found to be weak in certain areas and were average or above in others. These students were also given individual exercises. A few of the students whose individual profiles showed them below average on the tests but consistent as far as the point scores on all the tests were concerned were included in the activity group. Those students whose scores were average or above the entire group were given a program of recreational activities of their own choosing. These activities included the following:

handball, basketball, badminton, volleyball, tennis, cage ball, touch football, wrestling, track events, swimming, and weight lifting. It might be noted here that these individuals could, at their own discretion, practice on all or any of the test events.

It was noted that through the point score system few of the participants in the tests received 100 points for performance in the test, although zero points were more common.

At the end of the quarter the students were re-tested and were graded according to the results. The grading system employed by the college is based upon the amount of improvement noted between the first test and the test administered at the end of the quarter, the excellence of performance in all tests, plus attitude and appreciation of physical education in general.

Individual programs

The above test battery was devised to measure the elements of motor fitness deemed essential by so many writers in the field of physical education. By administering the battery at the beginning of the first quarter, homogeneous grouping of students for physical activity was possible. The individual exercise group was composed of those recommended for such a program by the Health Service, those obviously under physical handicap, and those demonstrating need of special treatment through analysis of the

results of the screening test.

In the following paragraphs case numbers have reference to individuals whose individual profiles are listed in Appendix A.

Cases 1 and 23 showed general weakness in all areas the battery of tests purported to measure. Both were underweight, below average height, and suffering from Kyphosis. Through personal observation by the writer and through analysis of the results of the screening test, it was obvious that these two students needed development in all areas. The following is the program prescribed for them at the start of the quarter:

1. General warm-up--calisthenics and stretching exercises. (Five minutes)
2. Leg lifts from standing and sitting positions. (Five)
3. Sit-ups. (10)
4. Push-ups on the low parallel bars. (Five)
5. Rope skipping. (Five minutes)
6. Slow deep knee bends. (10)
7. Stall bar exercises. (Five minutes)
8. 10-pound weight press. (10)
9. Three laps around the gymnasium floor, striding one and walking one alternating.

This program was carried on for the first two weeks of the quarter. Another evaluation was given to

determine any progress made in the areas. It was found that Case 1 was showing more development or more progress in the strength of the shoulder girdle and arms than in the speed and endurance areas. Revision of his program was as follows:

1. General warm-up--calisthenics and stretching exercises. (Five minutes)
2. Sit-ups. (15)
3. Rope skipping. (Five minutes)
4. Slow deep knee bends. (15)
5. Block transfer practice. (15 blocks)
6. 20-pound weight press. (10)
7. Practice on the speed tests. (Four)
8. Leg lifts from standing and sitting. (10)
9. Push-ups on low parallel bars. (10)
10. Alternating two laps running and one lap walking around the gymnasium floor. (Six laps running)

This program was continued for the next four weeks. After the third evaluation was made, the results obtained indicated that Case 1 was progressing in all areas with the exception of agility. A third program was devised as follows:

1. General warm-up--calisthenics and stretching exercises. (Five minutes)
2. Leg lifts using shoe weights, starting with five lifts with each leg from both the

standing and the sitting position progressing to 20 lifts.

3. 40-pound weight press, starting with five presses increasing to 20.

4. Dipping on the parallel bars, increasing to maximum.

5. Speed test practice, twice each period.

6. Knee bends using 20-pound weight, progressing from five to 15.

7. Block transfer practice. (15 blocks)

8. Increase endurance running from five laps jogging to five laps running.

9. Activity program after the completion of the above corrective exercises.

The addition of the activity program in this case was for the purpose of developing agility. The activities participated in were basketball, volleyball, handball, and cage ball. The above program was continued for the remainder of the quarter.

From the results of the second evaluation of Case 23, it was found that he was improving in agility and in strength of the arms and shoulder girdle. Little progress was noted in hand-eye coordination and none in the explosive power of the legs, speed, or endurance. His revised exercises were as follows:

1. General warm-up--calisthenics and

stretching exercises. (Five minutes)

2. Sit-ups. (10)
3. Push-ups on low parallel bars. (10)
4. Slow deep knee bends. (10)
5. 20-pound weight press. (10)
6. Practice on speed test.
7. Rope skipping. (Five minutes)
8. Leg lifts from standing and sitting position. (10)
9. Endurance running around the gymnasium floor, alternating jogging two laps and walking one. (Jogging five laps)

This program was continued for the next four weeks before another evaluation was taken. The results of this evaluation showed him to be still low in endurance, explosive power of the legs, agility, and speed. The following program was his final group of exercises to be carried on the remainder of the quarter:

1. General warm-up--calisthenics and stretching exercises. (Five minutes)
2. Sit-ups. (25)
3. Dipping on the parallel bars. (All possible)
4. Knee bends progressing from 10 to 30.
5. 30-pound weight press starting with five presses and increasing to 25.

6. Leg lifts using show weights, starting with five lifts each leg from both standing and sitting positions, progressing to 15.

7. Rope skipping for five minutes.

8. Stall bar exercises. (Five minutes)

9. Endurance running around the gymnasium floor, jogging five laps and increasing to 10.

It might be noted here that Case 23 was required to participate in his corrective exercises for the 30 minutes each period. The length of the physical education period was 30 minutes two days a week.

Cases 26B, 47, 1B, 13B, and 18 were grouped into similar programs of individual exercises because all of them showed weaknesses in agility, speed, and endurance areas. Case 18 was above average in the dipping test but was included in this group because of his physical handicap. He was a victim of an automobile accident in which his right knee was crushed. Bone grafting in this area had made his right knee stiff with no action in that area. The program outlined for this group of individuals is as follows:

1. Warm-up--rope skipping. (Three minutes)
2. Push-ups on the low parallel bars. (10)
3. Rapid burpees. (Five)
4. Practice on block transfer. (Five blocks)
5. Zig-zag running through four chairs spaced eight feet apart. (Three times back and forth)

6. Weight press 20 pounds. (Five presses)
7. Curling 10 pounds. (Five curls)
8. Deep knee bends. (10)
9. Endurance running around the gymnasium floor--alternating running one and walking one. (Five running)

Case 18 had a substitute exercise for the deep knee bends and the burpees. He was given leg lifts using the shoe weights, making five lifts with each leg from standing and sitting positions.

The above program was carried on for 30 minutes for the first two weeks of the quarter. A second evaluation was given to determine the progress made in the various areas. It was found that each was improving in all areas in which the screening test showed them deficient. The original program was then continued for the next four weeks' period before another evaluation was given. Cases 18 and 1B continued to improve satisfactorily in all areas.

Their program was altered to the following:

1. General warm-up--rope skipping. (Five minutes)
2. Dipping on the parallel bars. (All possible)
3. Practice on block transfer. (15 blocks)
4. Weight press 30 pounds. (20 presses)
5. Zig-zag running through four chairs spaced five feet apart. (Five times back and forth)

6. Bicycling with shoe weights. (Three minutes)
7. Sit-ups. (25)
8. Endurance running, five laps jogging.
9. Activity program the last of the period.

Cases 26B, 47, and 13B continued to show slight improvement but were very weak in agility, strength of the arms and shoulder girdle, and endurance. Their final revised program was as follows:

1. Warm-up--rope skipping. (Five minutes)
2. Dipping on the parallel bars. (All possible)
3. Weight press 30 pounds, progressing from five to 25.
4. Bicycling with the shoe weights.
(Three minutes)
5. Block transfer practice. (15 blocks twice during the period.)
6. Chinning on the high bar. (All possible)
7. Endurance running--jog three laps, walk one, increase to jogging five laps.
8. Speed test practice.
9. Passing of the medicine ball to each other. (Five minutes)
10. Activity period at the end of exercises.

Cases 2 and 18B were victims of poliomyelitis. Case 18B's right leg and foot were smaller than his left. Normal musculature was also lacking. His heel was drawn

up due to contraction of the Achilles tendon so that it was impossible for him to walk normally. The test results showed him lacking in normal action of the legs, agility, strength, speed, and endurance. Case 2 suffered from partial paralysis of both legs. He walked with considerable difficulty and since it was impossible for him to run or jump, he was excused from all tests involving leg action at the beginning of the quarter. Strength of arms and shoulder girdle was still below average. The following program was devised for these two individuals:

1. General warm-up--arm swinging exercises.
(Five minutes)
2. Leg raising exercises from standing and sitting positions--progress from one to 10, each position.
3. Stall bar exercises. (Five minutes)
4. Push-ups on low parallel bars. (10)
5. Sit-ups. (Five)
6. Deep knee bends while hanging from stall bars. (Five)
7. Passing the medicine ball. (Five minutes)
8. Shooting baskets. (10 minutes)

Both individuals enjoyed shooting baskets. It was felt by the writer that by using this activity leg coordination might be increased. This program was continued for the first two weeks of the quarter. A second evaluation was

given both of these individuals. Case 2 was still excused from all of the tests except the medicine ball throw, dipping, and the arm speed test. He showed improvement in the tests which indicated the exercises were doing some good. Through constant observation it appeared that his leg action seemed to be improving. With this in mind the same program was administered for the next four-weeks' period. Case 18B showed improvement in all areas of evaluation of the screening test. This improvement was very small, but it was believed that this was partly caused by an attitude of inferiority. When some improvement was objectively demonstrated to him, his interest and enthusiasm were aroused and better cooperation for self-improvement was noted. He continued with the same program for the next four-weeks' period with the addition of one new exercise. This was a leg exercise in which an attempt was made to stretch the Achilles tendon and increase the strength of the tibialis anticus. A third evaluation was given each of these two boys after the four-weeks' period. It was found that Case 2 had improved much in the areas tested previously. He also attempted the rest of the tests of the battery. The results of those tests were far below average, naturally. However, the fact that he attempted the tests was quite an accomplishment. With this in mind, the following program was devised for him for the remainder of the quarter:

1. Warm-up--arm swinging exercises.

(Five minutes)

2. Push-ups on the low parallel bars. (20)
3. Deep knee bends from the stall bars. (20)
4. Sit-ups. (25)
5. Stall bar exercises--leg stretchers.

(Five minutes)

6. Leg lifts from both sitting and standing positions. (10 lifts each leg)
7. Chinning on the high bar. (Five)
8. 30-pound weight press. (10 presses)
9. Basketball shooting the remainder of the period.

This program was continued for the remainder of the quarter.

Case 18B's results of the third evaluation showed some improvement in all the areas. However, he showed more improvement in the speed and agility areas. With this in mind the following program of exercises was devised for him:

1. Warm-up--arm swinging exercises.

(Five minutes)

2. Push-ups on the low parallel bars. (20)
3. Deep knee bends from the stall bars. (20)

(Gradually progressing to doing knee bends without the aid of the stall bars.)

4. Stall bar stretching exercises of the legs. (Five minutes)

5. Chinning on the high bar. (Five)
6. 30-pound weight press. (10 presses)
7. Block transfer practice. (Five blocks)
8. Leg lifts from both sitting and standing positions. (10 lifts each leg, each position)
9. Basketball shooting the remainder of the period.

It might be noted here that his attitude toward the corrective exercises was much improved during the latter part of the quarter. This attitude improved so much that he often would be found in the gymnasium doing exercises on his own time after school or during his free periods throughout the day. The heel had been lowered so it lacked only two inches from reaching the floor. Consequently, his walking and running had improved greatly.

Cases 22, 25, 29, 73, 75, 8A, 6B, and 24B were found, as a result of the screening test, to be below average in all areas except that of agility. The following program was devised for this group:

1. Warm-up--stretching exercises. (Five minutes)
2. Stall bar sit-ups. (10)
3. Speed test practice. (Three minutes)
4. Push-ups on the low parallel bars. (20)
5. Block transfer. (15 blocks)
6. Deep knee bends. (20)
7. 20-pound weight press. (10 presses)

8. Sit-ups. (30)

9. Endurance running around the gymnasium floor--alternating running one lap and walking one--running five laps.

From the results of the second evaluation it was found that Cases 22, 29, 73, 75, 6B, and 8A were increasing more in speed and strength than in agility, explosive power of the legs, and endurance. The following exercises were prescribed for them through the next four-weeks' period:

1. Warm-up--stretching exercises.

(Five minutes)

2. Block transfer practice. (15 blocks)

3. Speed test practice.

4. Sit-ups. (30)

5. Deep knee bends using 10-pound weight. (20)

6. Chinning on the high bar. (All possible)

7. Rapid burpees. (10)

8. Endurance running--alternating running two laps and walking one--10 laps running.

9. Activity program the latter part of the period when time would permit.

Cases 25 and 8A demonstrated slight improvement in endurance and agility. Both, however, were uncooperative and antagonistic. The following program was prescribed for these two individuals:

1. Warm-up--stretching exercises.

(Five minutes)

2. Dipping on the parallel bars.

(All possible)

3. 30-pound weight press. (20 presses)
4. Deep knee bends using 10-pound weight. (20)
5. Skipping rope. (Five minutes)
6. Speed test practice.
7. Stall bar arch. (Five)
8. Endurance running--10 laps around the gymnasium floor alternating running three laps and walking one.

This program was followed for the full 30 minutes of each physical education period for the remainder of the quarter.

Cases 14, 1A, 12A, 13A, and 34B were below average in strength of the arm and shoulder girdle, agility, speed, and endurance. Case 14 had a broken spine of the scapula which had not healed properly. Cases 1A and 12A were victims of asthma. Case 2A had a poorly set right elbow. It could not be fully extended or flexed. Case 34B was handicapped by a recent leg operation for "joint lice" in the knee, some of them remaining. Case 13A had an unhealed orifice from a mastoid operation. These individuals were grouped homogeneously because of the results of the testing program. The following is the program prescribed for this group:

1. Warm-up--rope skipping. (Three minutes)
2. Sit-ups. (20)

3. Push-ups on the low parallel bars. (10)
4. 20-pound weight press. (10 presses)
5. Chinning on the high bar. (Five)
6. Leg lifts from both sitting and standing positions. (Five)

7. Stall bar leg lifts. (Five)

8. Endurance running--alternating one lap running and one lap walking--running five laps.

Cases 1A and 12A also had a reverse breathing exercise intended to ameliorate this asthmatic condition. The second evaluation of these individuals showed that each had improved in all areas intended. Case 13A showed very little improvement because of his general attitude toward physical education in general. There was some evidence of improvement in the flexibility of Case 2A's elbow. Case 14 showed greater improvement in the speed and endurance and agility areas. Their program was altered to the following:

1. Warm-up--rope skipping. (Five minutes)
2. Stall bar arch. (Five)
3. Leg lifts--using shoe weights. (Five lifts from each position)
4. Deep knee bends using 10-pound weight. (10)
5. Medicine ball putting. (Five puts, each arm)
6. Chinning on the high bar. (All possible)
7. Dipping on the parallel bars. (All possible)

8. Curling 10 pounds. (10)

9. Endurance running--alternating running three laps and walking one--six laps running.

A third evaluation showed continued improvement in the areas of agility, speed, strength of the back and shoulder girdle, and endurance. The following group of exercises was administered for the remainder of the quarter:

1. Warm-up--stretching exercises.

(Five minutes)

2. Leg lifts using show weights. (10 lifts each position.

3. Sit-ups. (All possible)

4. Medicine ball putting. (10 puts each arm)

5. Dipping on the parallel bars. (All possible)

6. Curling 10 pounds. (15 curls)

7. Stall bar exercises.

8. Endurance running--five laps around the gymnasium floor.

This program was continued for the remainder of the quarter.

Through the process of giving two evaluations between the screening test and the follow-up test, it was possible to concentrate more satisfactorily on the areas needing development. Some of the exercises administered seemed to be accomplishing the desired development; some

seemed to indicate more development in the areas not concentrated; and some seemed to cause a lowering of status in that particular area.

Chapter IV

ANALYSIS OF DATA

The purpose of this study, as stated in Chapter I, was to determine whether a program of special exercise directed toward the handicaps of the physically deficient individuals as compared to the individuals experience in an optional program in physical education would result in more desirable improvement.

Partial answers to some of the questions were given in the review of literature. In Chapter III the method of measurement and classification of students was shown and types of individual exercise programs for various deficiencies were described. In the following pages, test data, as compiled and analyzed, will provide an answer to the last subordinate question, How can alterations of status in these areas be appraised?

Comparison of test results

The averages of the test scores of 136 participants in physical education were used to represent the normal performance. The difference between the mean of their scores in January and the mean of their scores in March denoted the average improvement shown in each test.

These data are compiled in Table 3.

Table 3.--ENTIRE PROGRAM, MEAN PERFORMANCE: WINTER QUARTER, 1945-46.

Event	Point score
Standing Broad Jump	
Screening test	45
Follow-up test	<u>50</u>
Improvement	5
Medicine Ball Throw	
Screening test	46
Follow-up test	<u>50</u>
Improvement	4
Block Transfer	
Screening test	42
Follow-up test	<u>50</u>
Improvement	8
Dipping	
Screening test	41
Follow-up test	<u>46</u>
Improvement	5
Dodge Run	
Screening test	45
Follow-up test	<u>51</u>
Improvement	6
Arm and Leg Speed	
Screening test	19
Follow-up test	<u>50</u>
Improvement	31
Endurance Run	
Screening test	40
Follow-up test	<u>49</u>
Improvement	9

Point scores were derived from the participants in physical education for the fall quarter of 1945-46.

Averages were obtained for the optional group. These data are compiled in Table 4.

Through the analysis of the screening test, it was found that there were 39 individuals who showed need for development in definite areas. There were 97 individuals whose profiles showed them sufficiently high or their profile level enough in all areas to permit them to participate in the activity program.

In order to determine the value of specialized programs for handicapped students, it was necessary to compare each individual's improvement with the average improvement of the optional group, shown in Table 4. This procedure made it possible to analyze each case separately and to draw conclusions which would indicate the benefit derived from the remedial program.

The analysis of results of the individual cases is presented on the following pages.

Case 1 made considerable improvement in all of the tests with the exception of the strength and power of the legs and agility. Even though exercises were prescribed to increase the abilities in these areas, no improvement was noted. His strength in the arms and shoulders improved seven points as was shown in the medicine ball throw to an average improvement of 7.9591 points by the

Table 4.--OPTIONAL PROGRAM, MEAN PERFORMANCE: WINTER
QUARTER, 1945-46.

Event	Point score
Standing Broad Jump	
Screening test	46.8866
Follow-up test	<u>58.7629</u>
Improvement	11.8763
Medicine Ball Throw	
Screening test	48.2165
Follow-up test	<u>56.1856</u>
Improvement	7.9691
Block Transfer	
Screening test	43.3814
Follow-up test	<u>58.8144</u>
Improvement	16.4330
Dipping	
Screening test	41.6082
Follow-up test	<u>52.8866</u>
Improvement	11.2784
Dodge Run	
Screening test	48.1753
Follow-up test	<u>54.8691</u>
Improvement	6.6938
Arm and Leg Speed	
Screening test	24.6495
Follow-up test	<u>52.4021</u>
Improvement	27.7526
Endurance Run	
Screening test	46.8866
Follow-up test	<u>55.8969</u>
Improvement	9.0103

optional group. He gained 10 points in the dipping test as compared to 11.2784; 19, as compared to 16.4330 in the block transfer; and 25, as compared to 9.0103 in the endurance running.

Case 23 increased in all areas with the exception of the medicine ball throw. This might have been due to the physical make-up of the individual. He did increase his distance by four feet but it still showed no improvement as determined by the point score system. He still received zero points for that performance. His point scores increased in the other tests as compared with the optional progress as follows: standing broad jump, three points as compared with 11.8763 for the optional group; 28 points, as compared with 16.4330 in the block transfer; 28 points, as compared with 11.2784 in the dipping; 31, as compared with 6.6938 in the dodge run; 31 points, as compared with 27.7526 in the speed test; two, as compared with 9.0103 in the endurance run.

Case 26B increased in all areas in which corrective exercises were prescribed. He showed considerable improvement in agility, arm strength, and endurance areas which are indicated as follows: an increase of 22 points as compared with 16.4330 points for the optional group in the block transfer; seven points, as compared with 11.2784 points in the dipping; nine points as compared with an increase of 9.0103 in the endurance running. He also increased

in the areas not prescribed as follows: standing broad jump by eight points as compared with 11.8763 for the optional group; and 13 points, as compared with 27.7526 points in the speed test. He showed a decrease in the medicine ball throw by 31 points.

Case 47 increased in areas of agility, speed, and endurance as indicated by the point scores from the following as compared with the average for the optional group: 46 points increase as compared with 16.4330 for the optional group in the block transfer; three points as compared with 27.7526 in the speed test; three points as compared with 9.0103 in the endurance running; 10 points as compared with 7.9591 in the medicine ball throw. It might be noted here that this individual was of an antagonistic nature for the first part of the quarter. He showed a decrease of five points in the standing broad jump. Exercises were not administered to this particular area. His dipping test score remained at 12 points for both tests.

Case 1B showed remarkable improvement in all areas in which correction was directed. He was a very cooperative individual, using all of the time allotted and extra time as well on the exercises prescribed. He increased 54 points in the block transfer test as compared to 16.4330 points for the optional group. His dipping score was enlarged by 48 points as compared with 11.2784 points for the recreational group. His other test score

increments were as follows as compared with the optional group: eight points in the dodge run, compared to 6.6938; 50 points in the speed test, compared to 27.7426; 35 points in the endurance running, compared to 9.0103.

Case 13B showed improvement in hand and eye coordination as is indicated by the addition of 24 points in the screening scores, compared with 16.4330 points for the optional group, in the block transfer. He was able to increase his score on the speed test by 18 points, the optional gain being 27.7526. The endurance running showed an enlargement of 14 points, the optional being 9.0103 points. He was able to augment his medicine ball throw six points, the optional being 7.9591 points. He showed no improvement in the areas not included in the corrective procedure. The dodge run decreased six points. His standing broad jump remained at 45 points for both tests.

Case 18 improved greatly in the areas for which exercises were devised. His block transfer score showed a gain of 26 points, the optional group being 16.4330 points. He was able to augment his score on the dodge run by 50 points, which surpassed that of the optional group of 6.6938 points. His other scores as compared with the optional group were as follows: 11 points, compared with 27.7526 points in the speed test; 19 points in the endurance test, compared to 9.0103 points; and seven points, compared to 7.9591, in the medicine ball throw. His

increases surpassed the increases in all the tests with the exception of the speed test and the medicine ball throw test attained by the optional group. It might be noted here that he decreased in the standing broad jump by eight points and by five points in the dipping test. However, he was able to improve in all areas to such an extent that he was above average on all of the tests.

Case 2 made considerable increase on all tests except the strength test of the shoulders and back. He was able to increase his score in the standing broad jump by 40 points, the optional increase being 11.8763 points. He gained 31 points on the block transfer as compared with the average increase by the optional group of 16.4330 points; 19 points in dipping, compared with 11.2784 points for the optional group; 49 points, compared with 27.7526 points in the speed test; 31 points, compared with 6.6938 points on the dodge run. He was able to improve his score on the endurance running by 19 points, the optional gain being 9.0103 points. His point scores advances far surpassed those obtained by the recreational group. The raw score of his medicine ball throw was increased two feet, six inches. This increase was not significant enough to raise his point score above zero points.

Case 18B showed definite improvement in all areas the test battery purported to measure. Even though his right leg and foot were of less size than the left, he did

show a marked gain in those tests dealing with the action of the legs. It might be stressed here that at the end of the quarter he was able to place his heel flat on the floor. This was significant in itself for justification for corrective procedures in physical education. On top of this accomplishment, his test results showed an increase of 16 points in the standing broad jump, compared to 11.8763 for the optional group nine points as compared with 7.9591 points in the medicine ball throw; 11 points as compared with 16.4330 in the block transfer; nine points as compared with 11.2784 in the dipping; 11 points, compared to 6.6938 in the dodge run; 31 points, compared to 27.7526 in the speed test; and two points, compared to 9.0103 in the endurance running. His point scores increased more than those of the optional group in all tests with the exception of the block transfer, dipping, speed, and endurance running. This would indicate that his handicap did hinder him from attaining the desired goals. All of the tests in which his scores did not excel those of the optional group involved the action of the legs, with the exception of the dipping.

Case 22 increased his point scores in all areas in which the individual exercises were directed. His gains as compared with the optional gains were as follows: 18 points, compared with 7.9591 points in the medicine ball throw; 24 points, compared to 16.4330 in the block transfer;

five points, compared to 11.2784 in the dipping; 17 points as compared with 27.7526 in the speed test; 39 points, compared to 9.0103 points in the endurance run. His gains excelled those of the optional group in all the tests, with the exception of the dipping test. He was able to increase his standing broad jump by 10 points, the average of the optional group being 11.8763 points; and seven points in the dodge run, the optional average being 6.6938 points. These two tested areas were not included in the corrective procedures.

Case 29 made noteworthy progress in all areas desired. He improved in the standing broad jump by 19 points, excelling the optional gain of 11.8763 points. His other gains attained in contrast to those of the optional groups were as follows: 36 points in the medicine ball throw, as compared with 7.9591 for the recreational group; 79 points in the block transfer, compared to 16.4330 for the optional; 19 points in dipping, compared to 11.2784; 10 points in the speed test, compared to 27.7526; 13 points in the endurance running, compared to 9.0103. His agility test score as indicated showed an increase of five points, compared to 6.6938 for the optional group. All of his gains exceeded those attained by the recreational group with the exception of the speed and agility tests.

Case 75 showed less improvement in his areas of weakness, as was shown by the screening test. However,

his endurance had increased 12 points in contrast to 9.0103 gain for the recreational group. The point scores which excelled those of the optional group were as follows: standing broad jump, a gain of 27 points compared to 11.8763 for the optional group; eight points in the dodge run, compared to 6.6938 for the optional. Those areas in which he did not surpass the attainments made by the optional group were as follows: four points in the block transfer, compared to 16.4330 for the optional; nine points in dipping, compared to 11.2784 for the optional; 10 points in the speed test, compared to 27.7526; three points in the medicine ball throw, compared to 7.9591.

Noteworthy improvement was indicated from the results shown by the follow-up test of Case 73 in the areas of speed, endurance, hand and eye coordination, and the strength of the arms. His gains in point scores for these areas as compared with those of the optional group were as follows: speed test, 55 points, compared with 27.7526 for the optional; endurance running 51 points, compared with 9.0103 for the optional; block transfer 20 points, compared to 16.4330; 19 points in dipping, compared to 11.2784. The other tests in which he failed to attain the average increase of the optional group were as follows: five points in the medicine ball throw, compared to 7.9591 points for the optional group, and six points in the standing broad jump, compared to 11.8763 for the optional. A decrease of

13 points was shown in the agility area, or the dodge run test.

Case 8A suffered from a case of mumps toward the end of the quarter, leaving him in a weakened condition. His test results indicated this profusely. However, improvement was noted in the endurance test of 16 points, which surpassed the average gain of 9.0103 points for the optional group. He was able to increase his speed test score by 22 points, which was still below the average gain of 27.7526 points for the optional group. A decrease was noted of 18 points in the standing broad jump; of five points in the strength test of the back and shoulder girdle, or the medicine ball throw; of 15 points in the arm strength test, or the dipping; and of 17 points in the agility test.

Case 6B showed no increase from his exercise program, as is indicated by the following scores as compared with the optional gain: five points in the dipping, compared to 6.6938 for the optional group; 26 points in the speed, compared to 27.7526; and nine points in the endurance running, compared to 9.0103. Other areas not included in the exercise program showed the following increases: 10 points in the standing broad jump as compared with 11.8763 for the optional group; 10 points in the medicine ball throw, as compared with 7.9591 for the recreational group; and eight points in the dodge run as compared with 6.6938 points for the optional group.

Case 24B made little progress from his exercise program, as is shown by the following: the medicine ball throw progressed four points, the optional group making 7.9591 points increase; the speed test progressed 14 points, the optional group making 27.7526; and the endurance running increased seven points, compared to 9.0103 for the optional group. A decrease was noted in the block transfer test of 17 points and in the dipping of 10 points. However, the area of arm strength was not included in the corrective program. However, little progress was noted in the other areas of measurement. His scores on the dodge run remained at 41 points and the standing broad jump at eight points.

Case 12A indicated no increase in the arm strength test. This might have been due to the extreme height of the individual in comparison to his weight. He was six feet, two inches tall, and weighed 145 pounds. Increases were noted in all areas in which correction was directed. He was able to increase his point scores in the medicine ball throw of 11 points, compared with the average increase of 7.9591 for the optional group. The dodge run was improved 42 points, in contrast to the increase of 6.6938 points for the optional group. The speed test indicated much improvement by the score of 41 points increase, as compared with the optional average increase of 27.7526 points. Other areas not showing suitable gains

were as follows: five points in the endurance run as compared to 9.0103 points for the optional group; seven points in the standing broad jump, compared to 11.8763; 12 points in the block transfer, compared to 16.4330; and 11 points increase in the medicine ball throw, compared to 7.951.

Case 15 developed during the first part of the quarter an attitude of inferiority. It is the belief of the writer that the attitude he had developed was a detriment to any progress he might have attained. He did show a gain of three points in the standing broad jump, compared to 11.8763 points for the optional group. He was able to show suitable increase in the medicine ball throw of 22 points, compared to 7.9591 for the optional group. His speed score surpassed the optional average, increasing 35 points as compared with 27.7526. The endurance results were 16 points over the screening test, the optional being 9.0103 points. The dodge run was improved 23 points, compared to 6.6938 points for the optional group. He did show some improvement in the dipping test of five points, the optional average being 11.2784. The individual did improve his attitude after a reasonable amount of success was felt. This is indicative as shown by the improvement noted in his test scores. The point score of the block transfer still remained at zero because his raw score was not high enough to merit any points. However, he did

increase his raw score 4.0 seconds.

Case 1A showed a decrease of 15 points in the endurance run and six points in the medicine ball throw. This would indicate the exercises applied to these areas were of no benefit. His other point scores increased as follows in comparison with those of the optional group: 10 points increase in the standing broad jump as compared to 11.8763 points for the optional group; five points in the block transfer compared to 16.4330; four points in dipping compared to 11.2784; 21 points in speed compared to 27.7526 points. No improvement was indicated in the dodge run as the point scores would show. However, the raw score increased .1 seconds.

Case 13A indicated much improvement along the areas desired. He was able to increase his endurance run by 18 points, in contrast to 9.0103 points for the optional group. The medicine ball throw showed a gain of 13 points, in contrast to 7.9591 for the optional group. Dipping was increased by 19 points, the optional being 11.2784 points. Improvement was also noted in areas not included in the corrective program. These increases as compared with the optional group were as follows: standing broad jump, 19 points, compared to 11.8763 points; dodge run 16 points, compared to 6.6938 points; block transfer 13 compared to 16.4330; and speed 26 points, compared to 27.7526 points. This individual surpassed all averages made by the optional

group with the exception of the speed and the block transfer tests.

Case 34B, being a victim of "joint lice" of the knee, showed a definite hindrance throughout the corrective program. Whenever one of these cartilage kernels would find its way into the joint, action of that would have to cease. However, through participation in the corrective program, the following results were shown: 10 point increase in the standing broad jump, compared to 11.8763 points for the optional group; 20 points in the dodge run, compared to 6.6938 points for the optional group; 34 points in the speed test, in contrast to 27.7426 points for the optional; and 10 points in the endurance, as compared to 9.0103 for the optional. A decrease was noted in the medicine ball throw of six points and 14 points in the dipping.

Averages were obtained for the entire corrective group. These data are compiled in Table 5.

Summary

1. Eleven of the individuals showed an increase in all the areas in which special correction was directed.

2. Six of the individuals participating in a part correction and part optional program showed a decrease in the point scores in the events in which the optional exercise was directed.

Table 5.--CORRECTIVE PROGRAM, MEAN PERFORMANCE: WINTER QUARTER, 1945-46.

Event	Point score
Standing Broad Jump	
Screening test	28.2308
Follow-up test	<u>36.0513</u>
Improvement	7.8204
Medicine Ball Throw	
Screening test	29.5385
Follow-up test	<u>38.6154</u>
Improvement	9.0769
Block Transfer	
Screening test	21.8462
Follow-up test	<u>41.7436</u>
Improvement	19.8974
Dipping	
Screening test	26.8205
Follow-up test	<u>36.5128</u>
Improvement	9.6923
Dodge Run	
Screening test	23.8205
Follow-up test	<u>34.8718</u>
Improvement	11.0513
Arm and Leg Speed	
Screening test	13.7179
Follow-up test	<u>40.1795</u>
Improvement	26.4616
Endurance Run	
Screening test	19.7949
Follow-up test	<u>34.3590</u>
Improvement	14.5541

3. Eight of the individuals showed no improvement in the areas in which corrective exercises were administered.

4. The entire corrective group increased in the program as compared with the optional group in the following test items: medicine ball throw, block transfer, dodge run, and endurance.

Chapter V

DISCUSSION

The original data were obtained through the administration of a battery of physical fitness tests to 136 students enrolled in physical education at Colorado Agricultural and Mechanical College for the winter quarter of 1945-46.

From the results of the screening test or the first test administered at the first week of the quarter, the students were classified into the various groups based upon the norms established. Point scores were devised from the results of the testing program at the end of the fall quarter using the T-score formula. Individuals whose scores were consistent on all tests, above average on all tests, or above average on three or more tests composed the optional group or recreational group. Individuals whose scores were all below average, extremely below average on three or more tests, or obviously had postural or other physical defects composed the corrective group. It was found that there were 39 students composing the corrective group and 97 in the optional group. For the optional group, activity facilities were made available. Activities participated in were handball, basketball, cage ball, touch

football, volleyball, tennis, badminton, and wrestling. Individual exercise programs were devised for the correction of the weakness or handicap of the individuals making up the corrective group. After the first two-weeks' period a second appraisal was made of all in the remedial group to note progress accomplished. From the results of this evaluation, the exercises were altered depending upon the progress made. This program was continued for the next four-weeks' period. At the end of this period a third evaluation was made and progress noted. The individual exercises were changed to conform with the results of this test, concentrating on those areas not progressing sufficiently, and some exercises were adjusted to meet increased ability in other areas. This third revision of exercises continued to the end of the quarter. At this time, the final evaluation was given to all students in both the corrective and the optional groups. From the results of this evaluation, case study comparisons were made between the individual's progress and the optional group's progress. The discussion of these case studies is included in the following paragraphs.

The individual profile of Case 1, presented in Appendix A, showed a lack of improvement in the strength and explosive power of the legs. The exercises designed for this area were deep knee bends, leg lifts, and stall bar exercises. He showed very little progress in agility

or speed. Limited participation in the general activity program was prescribed to effect improvement in these areas. With the noticeable lack of improvement made in these two areas, it might be said that the exercises prescribed for this individual were not suitably concentrated for that development. Near average improvement was noted in the areas of strength of the arms and of the back and shoulder girdle. Notable improvement was made in endurance which indicated the exercises prescribed for this area accomplished the desired results. It might be noted here that through individual differences some persons may increase more in one area and less in others. This might be the situation in this case.

Case 23 was 58 inches tall and weighed 85 pounds. He showed an improvement of four feet in the medicine ball throw test, although his point score remained at zero, and this improvement consequently does not show up on his profile. Considering his size, this increase was quite satisfactory. The exercise designed for development in this area were the push-ups on the low parallel bars, weight presses, and rope skipping. Noticeable improvements were made in the areas of hand and eye coordination, arm strength, and agility. The exercises prescribed for these areas were block transfer practice, rope skipping, and practice on the speed test. It was felt by the writer that through the practice on the two test items, development in

the areas involved would take place. It is true that practice on the test items does increase skill in any particular test. However, practice was permitted to all individuals regardless of classification. Very little improvement was made in the strength and explosive power of the legs and the endurance areas. The exercises designed for these areas were deep knee bends, leg lifts, and endurance running around the gymnasium floor. Evidently the exercises were of little value for this individual.

Case 26B showed remarkable improvement in the area of agility. The exercise designed for this area was zig-zag running. His arm strength did not meet the increase shown by the optional group. The exercises designed for this area were dipping on the low parallel bars, chinning on the high bar, and the weight presses. Near average improvement was noted in the endurance run. The exercise designed for this area was endurance running around the gymnasium floor. His improvement, while satisfactory, was not impressive. He also showed improvement in areas for which the corrective exercises were not designed, although he did not match the average increase of the optional group. This increase might be due to the carry-over value of the exercises prescribed for the weakened areas. However, he decreased greatly in the areas of arm and shoulder girdle strength. This is indicative of the lack of concen-

tration directed toward this area.

Case 47 showed remarkable progress in the area of hand and eye coordination. The exercise designed for this area was the practice on the block transfer test. By practicing with 15 blocks, the opportunity for development of hand and eye coordination was emphasized. His individual profile showed that improvement in strength of back and shoulder girdle area surpassed the average improvement of the optional group. The exercises devised for this area were weight presses, chinning, and passing of the medicine ball. In the areas of endurance and speed he fell far below the advances of the recreational group. Evidently, the exercises prescribed for these two areas were of little value. Since this student participated in the general activity program after the corrective exercises had been completed, he had the same opportunity for development as the members of the optional group. His failure to make a comparable improvement indicates a low level of potential ability. However, it was impossible to interest him in exercises or activities other than those directed toward development of arm strength. The failure to achieve satisfactory results in this case may be ascribed to lack of cooperation on the part of the student.

Case 1B, being a very cooperative person, showed remarkable improvement in all the areas toward which corrective procedures were directed. Greater gains in speed,

hand and eye coordination, endurance, and arm strength were recorded than in other areas. In all of these and in agility, his increase was greater than the average of the optional group. This is evident as shown by his profile in Appendix A. His program obviously yielded excellent results.

Case 13B was able to surpass the average gain made by the optional group in endurance and hand and eye coordination. This was the desired objective.

Case 18 was able through his program of individual exercises to make remarkable gains in all areas with the exception of speed, strength of the back and shoulder girdle, and the explosive power of the legs. He lacked full use of the knee which was stiffened as a result of an automobile accident. This set definite limits on his ability. His program was prescribed for the purpose of affording normal development in areas not affected by this handicap. As his profile shows, these results were achieved.

The individual profile of Case 2 showed ample progress in all areas of measurement. An improvement of two and one-half feet in his raw score in the medicine ball throw was registered, although his point score still remained at zero. He was unable to participate in any tests involving leg action at the first of the quarter. At this time he had developed, since his illness, the

attitude that very little could be done to overcome his handicap. Motivation of this person was needed before any progress could be made. This attitude continued into the second four-weeks' period. During this period, he began to realize that his efforts to perform the deep knee bend exercise from the stall bars were accomplishing the desired result. He could do these with less assistance from his arms than when he started the program. From this time to the end of the quarter he diligently participated in the corrective procedures. Great progress was made during the corrective period and an attitude of confidence developed which enable him finally to participate in the entire testing program. His increase in all areas is indicative of the advisability of the use of corrective procedures in ameliorating handicaps.

Case 18B made noticeable progress in stretching the Tendon of Achilles. This in turn enabled him to walk almost normally and emphasizes the value of corrective procedures in physical education classes. In addition to this accomplishment, he was able to surpass the average gains of the optional activity group in the areas of explosive power of the legs, strength of back and shoulder girdle, and agility, as his profile shows. Near average improvement was noted in speed, hand and eye coordination, and arm strength. It is probable that this individual might have progressed more had he been able to participate in the

activity program. He improved very little in endurance. As was anticipated, his physical handicap proved to be a definite limitation to progress in certain areas.

Case 22 was low in arm strength, speed, endurance, and hand and eye coordination. His program was directed toward improvement in these areas. Examination of his profile shows that the results made were quite satisfactory. The explanation for this may be found in the fact that it was impossible to interest him in the prescribed program. At every opportunity, this student would participate in the games with the optional group, thus building up the areas already well developed at the expense of further deterioration in low areas.

The profile of Case 29 showed little gain in the speed and agility areas. Ample gains were made in the areas of endurance, explosive power of the legs, and agility. He failed to make satisfactory improvement in the areas of arm strength, speed, strength of the back and shoulder girdle, and hand and eye coordination. This individual had a program in which approximately one half of the physical education period was spent in correction, the other in the activity program. He would hurry through his special program so as to spend more of his time playing basketball.

Case 73 made noteworthy gains in the areas of endurance, speed, hand and eye coordination, and strength of the arms. He showed a decrease in the area of agility

and unsatisfactory improvement in strength of back and shoulder girdle and explosive power of the legs. In general his program failed to meet his needs. This is evident as is shown by his profile.

Case 8A showed improvement in the area of endurance. His gains in the other areas were insignificant as compared with those of the activity group. His profile bears this out. This student was convalescent from mumps at the time of the final test and this is believed to account for the fact that satisfactory gains were not recorded.

The corrective exercises for Case 6B were directed toward the areas of arm strength, speed, and endurance. He was unable to meet the average gains made by the activity group in these areas. This would indicate the exercises were insufficient and not sufficiently concentrated for this individual. He was able to show more improvement in areas not included in the corrective exercise program as is indicated by his profile. Considering this evidence, it appears that this individual might have made more progress had he participated in the activity program entirely.

Case 24B showed a decrease in the areas of arm strength and hand and eye coordination. The arm strength area was not included in the corrective procedures. Small gains were noted in the areas of back and shoulder girdle strength, speed, and endurance. His profile demonstrates

that these gains did not reach the average gains made by the optional group. Evidently, the exercises prescribed for this individual had little value for him.

Case 12A made noteworthy progress in some of the areas for which corrective exercises were devised. These areas were strength of the back and shoulder girdle, agility, and speed. Other areas not surpassing the average improvement of the optional group were endurance, explosive power of the legs, hand and eye coordination, and arm strength. It is felt by the writer that the lack of progress made in the area of arm strength was due to the extreme height of this individual. The exercises designed primarily for the development of the legs were evidently not suited to him. The exercises designed for agility, speed, and strength of the back and shoulder girdle resulted in ample progress. His individual profile verified this fact.

Case 14 started out the quarter with an attitude of inferiority. This attitude continued well into the latter part of the period of correction. It was not improved until a reasonable amount of success had been accomplished. This is evident as was shown by the progress in the areas of strength of the back and shoulder girdle, speed, endurance, and agility, as compared with the average gain accomplished by the optional group. The optional group gains surpassed his gains in the hand and eye coor-

dination, arm strength, and explosive power of the legs. This would indicate the corrective procedures designed for those areas did not meet his needs.

The profile of Case 1A showed him to surpass the optional gains in the area of speed. He fell below the anticipated gain in all other areas. It is obvious that this individual gained little from his corrective exercises. The writer now believes that he was improperly classified and should have participated in the general activity program.

Case 13A showed significant improvement, through analysis of his profile, in the areas of endurance, strength of the back and shoulder girdle, strength of arms, explosive power of the legs, and agility. The exercises designed for these areas seemed to have accomplished the desired results. Near average increases were noted in the areas of speed, and hand and eye coordination. Few exercises were available for the development of these areas. It is possible that this individual might have accomplished more had he participated in the activity program for these areas.

Case 34B surpassed the average gain of the optional group in the areas of agility, speed, and endurance. This would indicate the exercises prescribed for these areas were suitable. Near average improvement was noted in explosive power of the legs. A decrease was shown by his

profile in the arm strength and back and shoulder girdle strength. The program was only partially successful so far as he was concerned.

Many of the students composing the corrective group were individuals who through their schooling prior to college were inactive. Few of them had experienced participation in extracurricular physical activities. Motivation of these individuals was a major problem. The exercises designed for these weakened individuals seemed satisfactory. However, without the development of a desirable psychological attitude, little progress was accomplished. Other individuals composing the remedial group were those with definite physical handicaps. The motivation of these individuals was likewise a major problem. Most of them had developed the attitude that their handicap was present and that little could be done to alleviate it. A reasonable amount of success had to be experienced before this inferiority complex could be overcome. Some of the individuals in this group achieved this experience early in the quarter, while others never achieved it. These factors must be considered in analyzing the individual profiles.

By means of Tables 4 and 5, a comparison was made between the entire groups of the corrective and optional programs. It was found that the corrective group increased more in the following test items than did the optional group: medicine ball throw, 9.0769 for the corrective and

7.9691 for the optional; block transfer, 19.8974 for the corrective and 16.4330 for the optional; dodge run, 11.0513 for the corrective and 6.6938 for the optional; endurance run, 14.5641 for the corrective and 9.0103 for the optional. This would indicate the exercises prescribed for the areas of back and shoulder girdle strength, hand and eye coordination, agility, and endurance proved to be satisfactory for the entire corrective group as a whole. Very little difference was noted between the two groups in the speed test, the corrective gain being 26.4616 and the optional gain being 27.7526.

The optional group surpassed the corrective group gains in the following test items: standing broad jump, 11.8763 for the optional and 7.8205 for the corrective; dipping, 11.2784 for the optional and 7.8205 for the corrective. This would indicate that through a program of activity the explosive power of the legs and the arm strength develop more rapidly than through a program of exercises designed for these areas.

Recommendations for further study

1. A statistical analysis of the results of a prescriptive program of exercises applied to individuals with weak musculature but without medical handicaps. This should be compared with the progress of a control group of similar compo-

sition taking an optional program. Such a study should be continued over a period of time sufficient to afford opportunity for variation in type of prescriptive exercises for the various areas of weakness.

2. A statistical analysis should be made of the relationship of age, height, weight, and possibly other factors to scores on the seven tests presented in this study.

3. Research is needed on the development of valid standards for measuring the individual physical progress of sub-normal cases.

2. A more flexible method of appraisal should be provided for the measurement of the status of individuals who do not conform to normal standards.

3. A progressive group of exercises which would insure more satisfactory results in a program of correction should be developed.

4. There should be installation of therapeutic facilities in physical education plant, available for all individuals in need of such treatment.

5. There should be initiated a continued program of corrective procedures designed for handicapped individuals under the guidance of qualified personnel throughout the period of school attendance.

6. A statistical analysis should be made of the relationship of age, height, and weight to each of the test items presented in this study.

7. A further study of the results of such a combined program with a variation in the prescriptive exercises used would prove most valuable.

Chapter VI

SUMMARY

The inclusion of the physically deficient individual into the general physical education class has been accomplished through the prescription and supervision of individual exercise programs directed toward the amelioration of a particular handicap or weakness.

The areas of physical status were defined and methods of evaluation of these areas were established by the Physical Education Department at Colorado Agricultural and Mechanical College.

Through a series of periodic evaluations during the quarter the progress made by the various groups was noted. The corrective or remedial group was evaluated at frequent intervals during the quarter. The optional group was evaluated only at the beginning and end of the quarter. Comparisons were made between the results obtained by the two groups on the first or screening test and the final or follow-up test.

The conclusions drawn from these comparisons indicate that individual exercise programs have specific value in the following areas: strength of the back and shoulder girdle, hand and eye coordination, agility, and

endurance, providing that a satisfactory attitude toward the program can be achieved. The recreational group through their program of activity showed marked improvement in the areas of explosive power of the legs and arm strength. The results of the speed test showed very little difference between the two groups. Average improvement in all areas was satisfactory in both groups.

Therefore, it may be concluded that a combination of an optional and an individual exercise program is feasible and yields valuable results for all participants.

A P P E N D I X

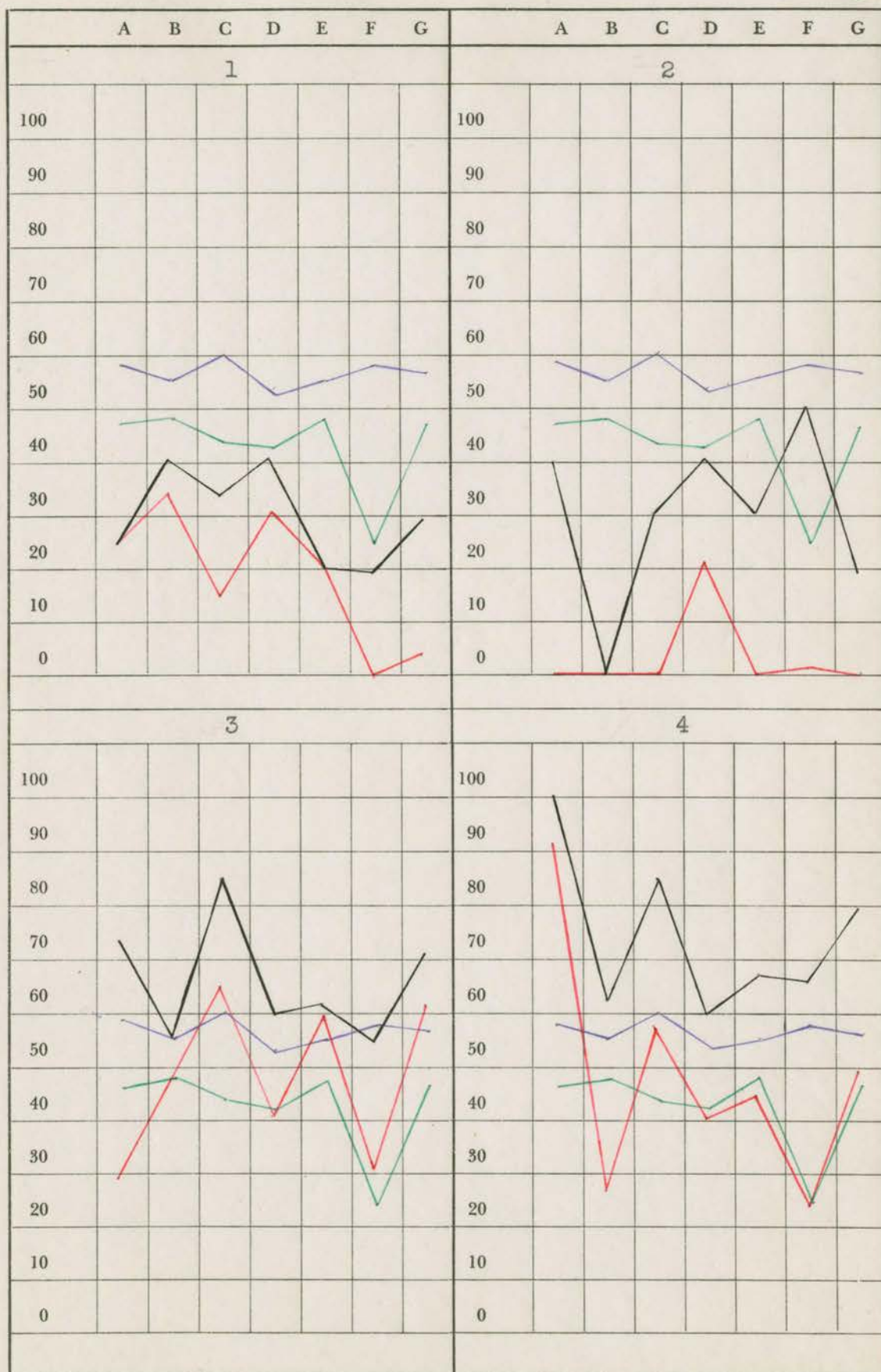
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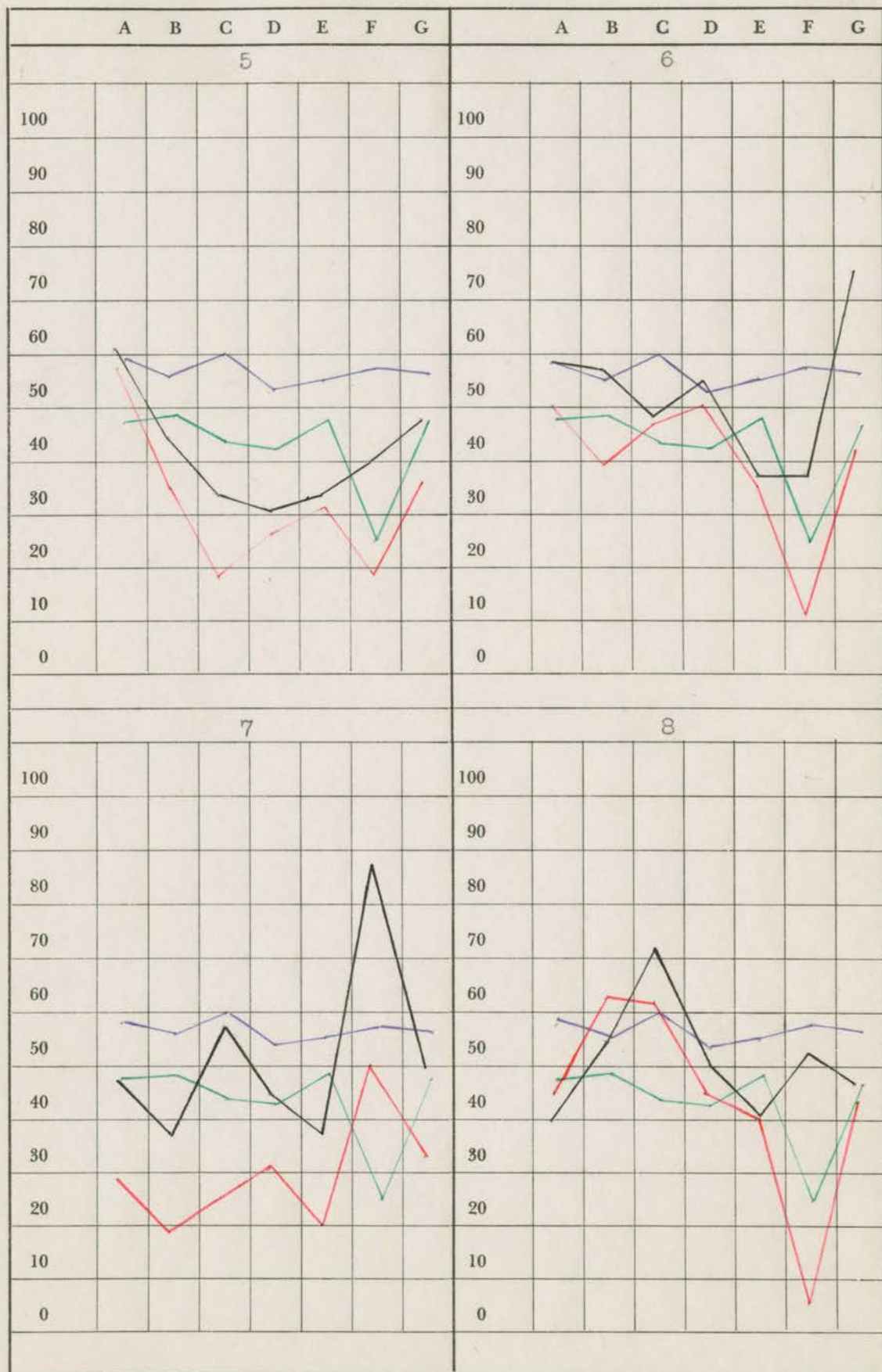
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A INDIVIDUAL PROFILES	88

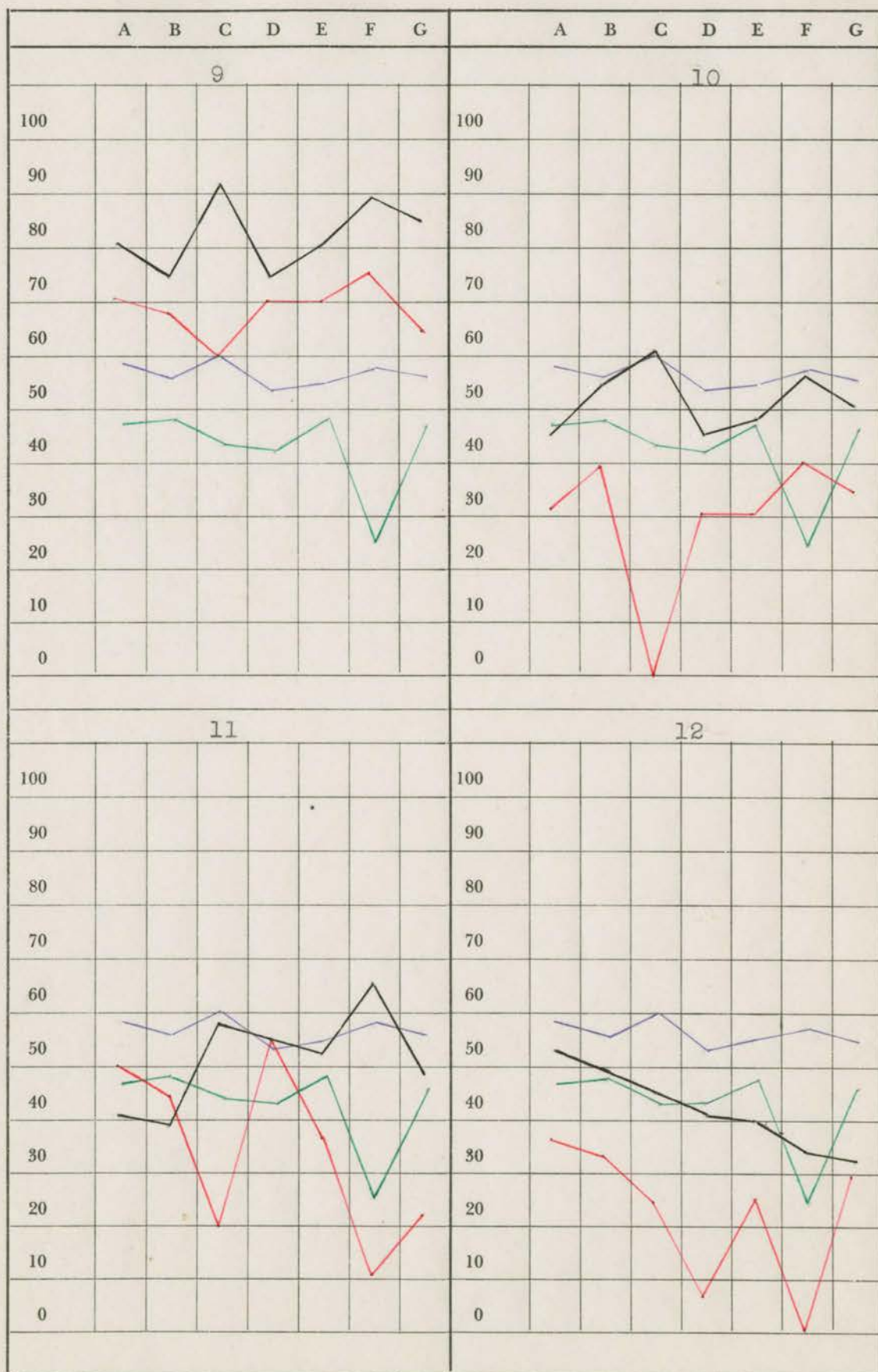
Appendix A.--INDIVIDUAL PROFILES

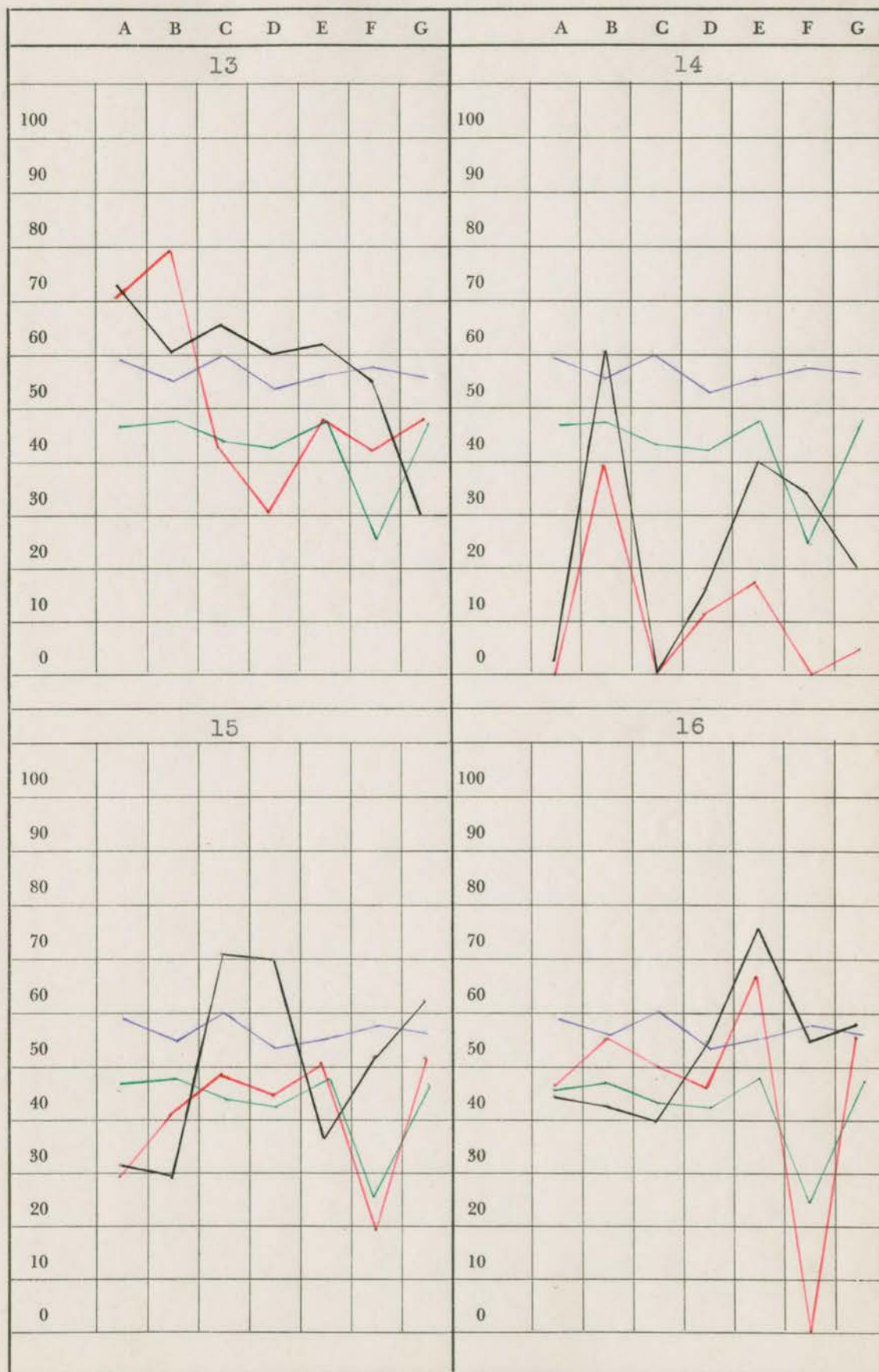
Individual profiles are included in Appendix A to give a more graphic comparison between the individual progress and the average increase of the optional group.

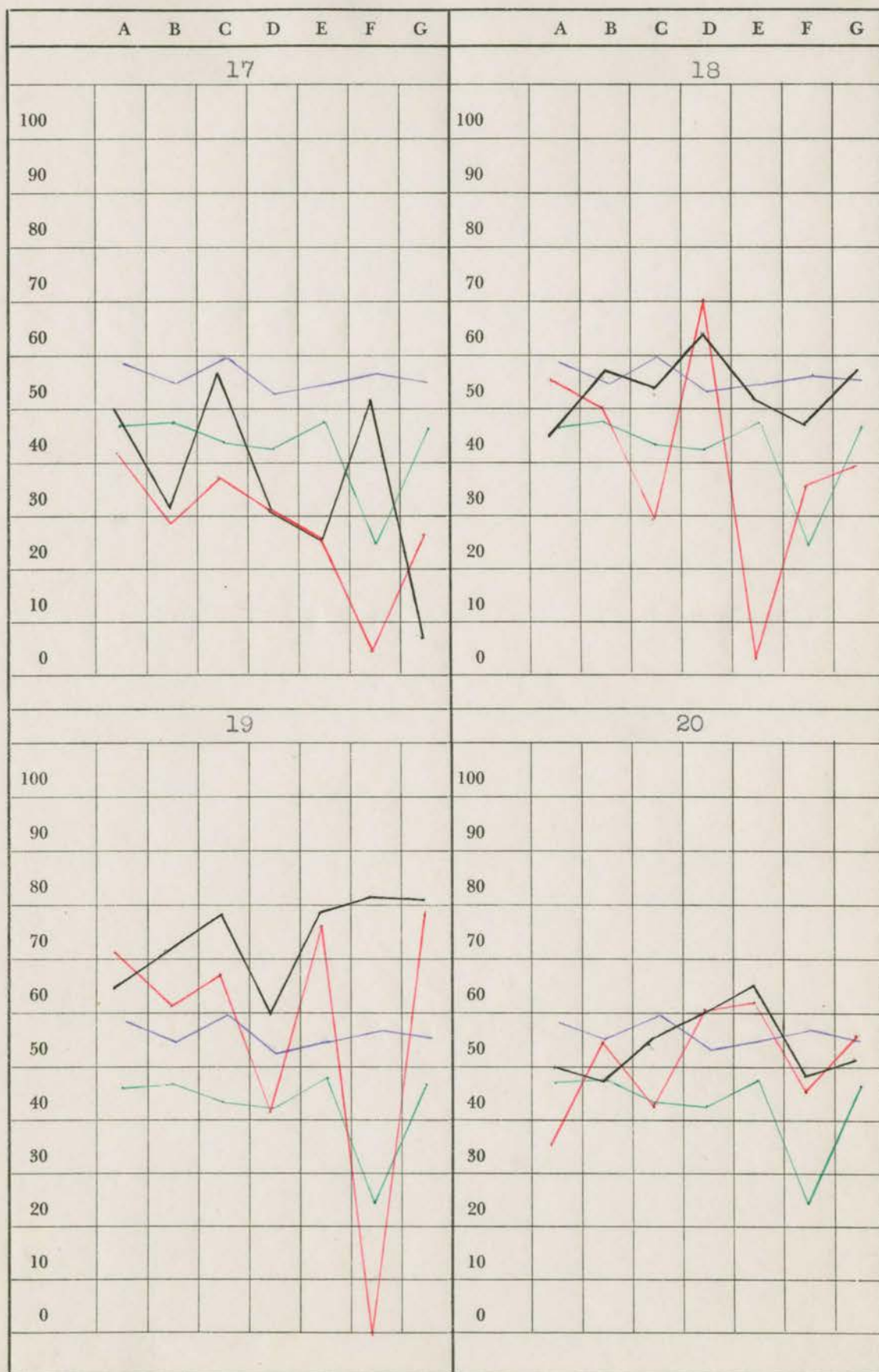
The green line indicates the averages obtained by the first evaluation of the optional group. The purple line indicates the averages obtained from the second evaluation of the optional group. The red and black lines indicate the first and second test results of the individuals, respectively.

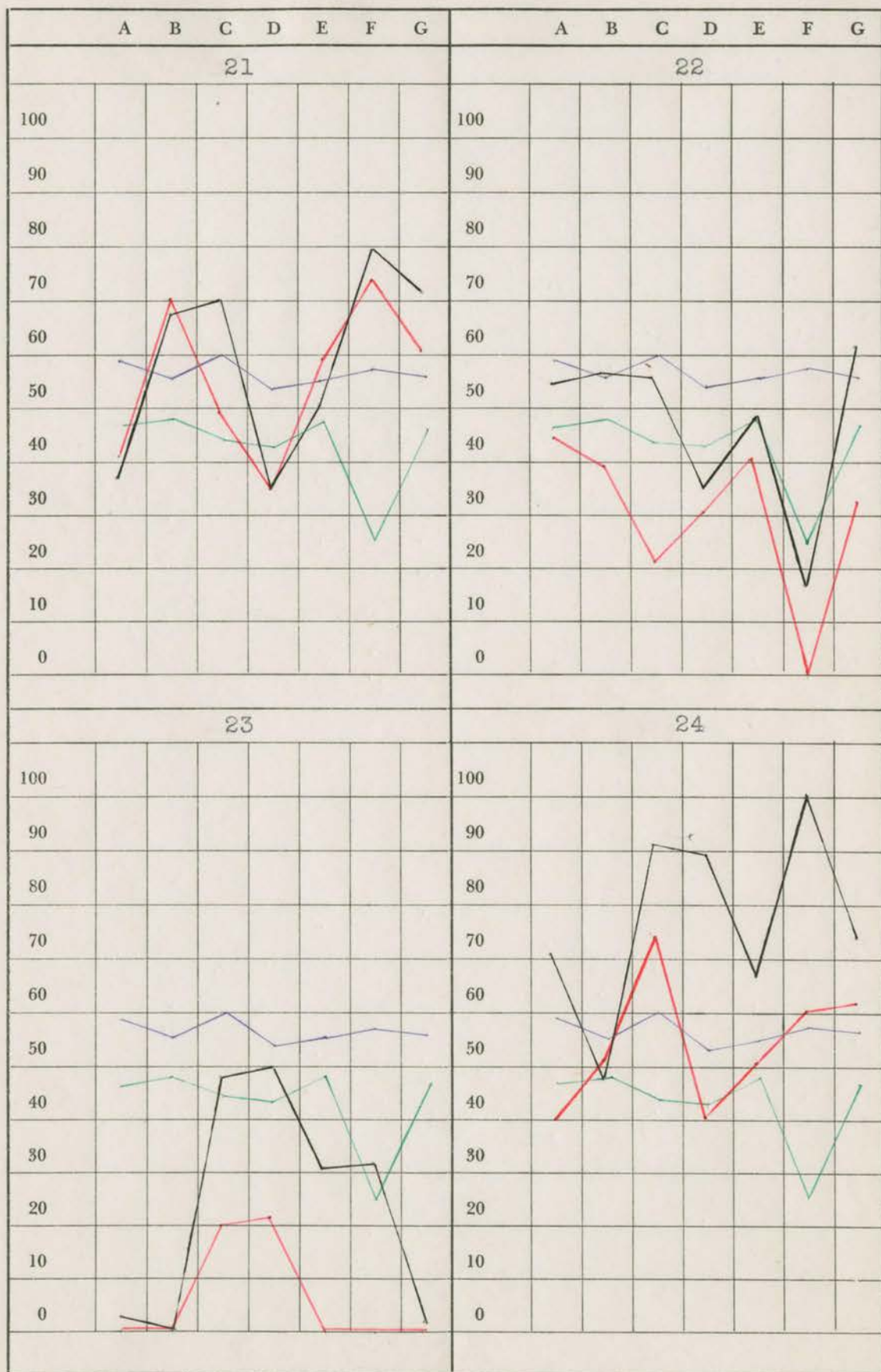


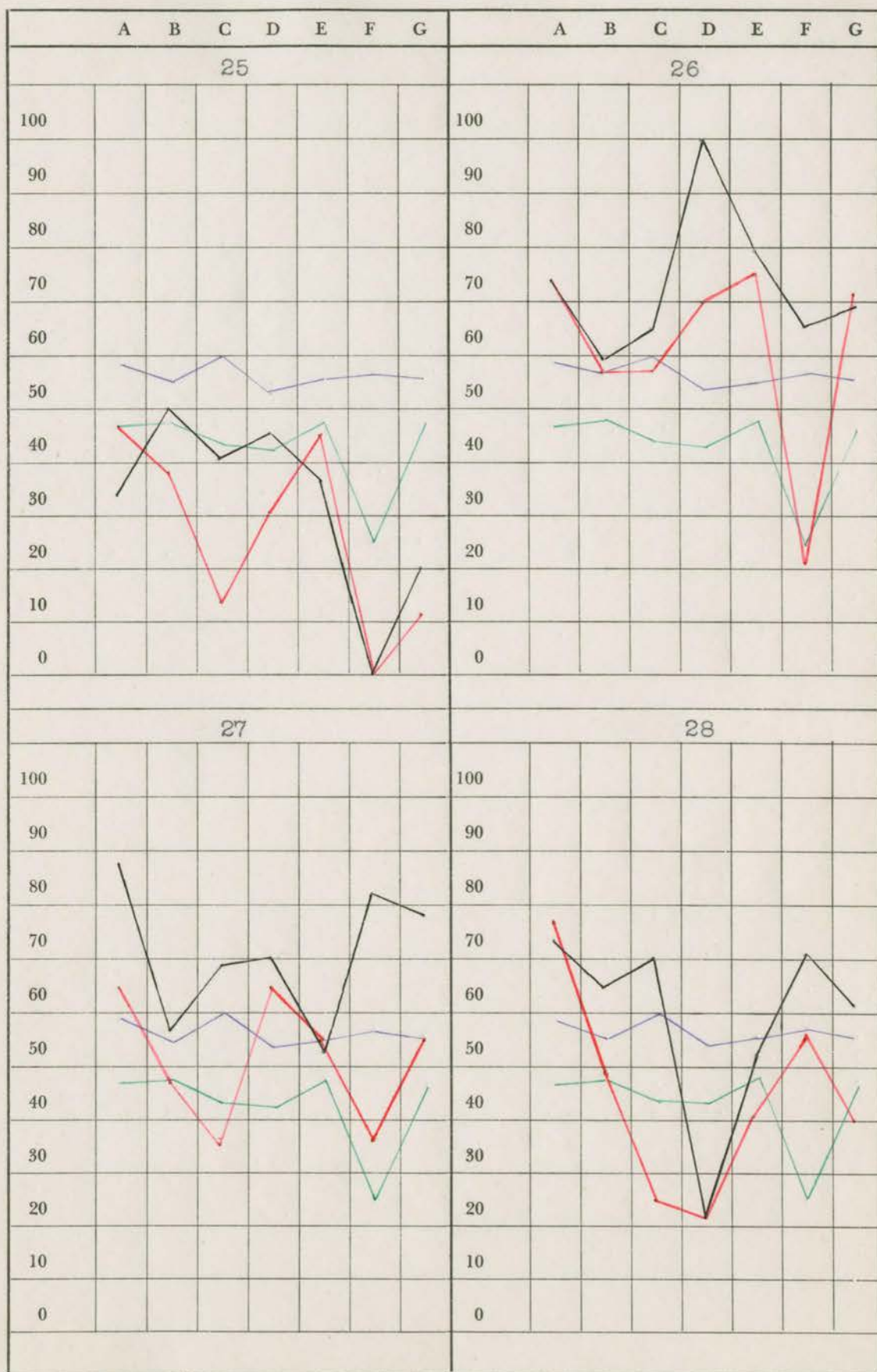


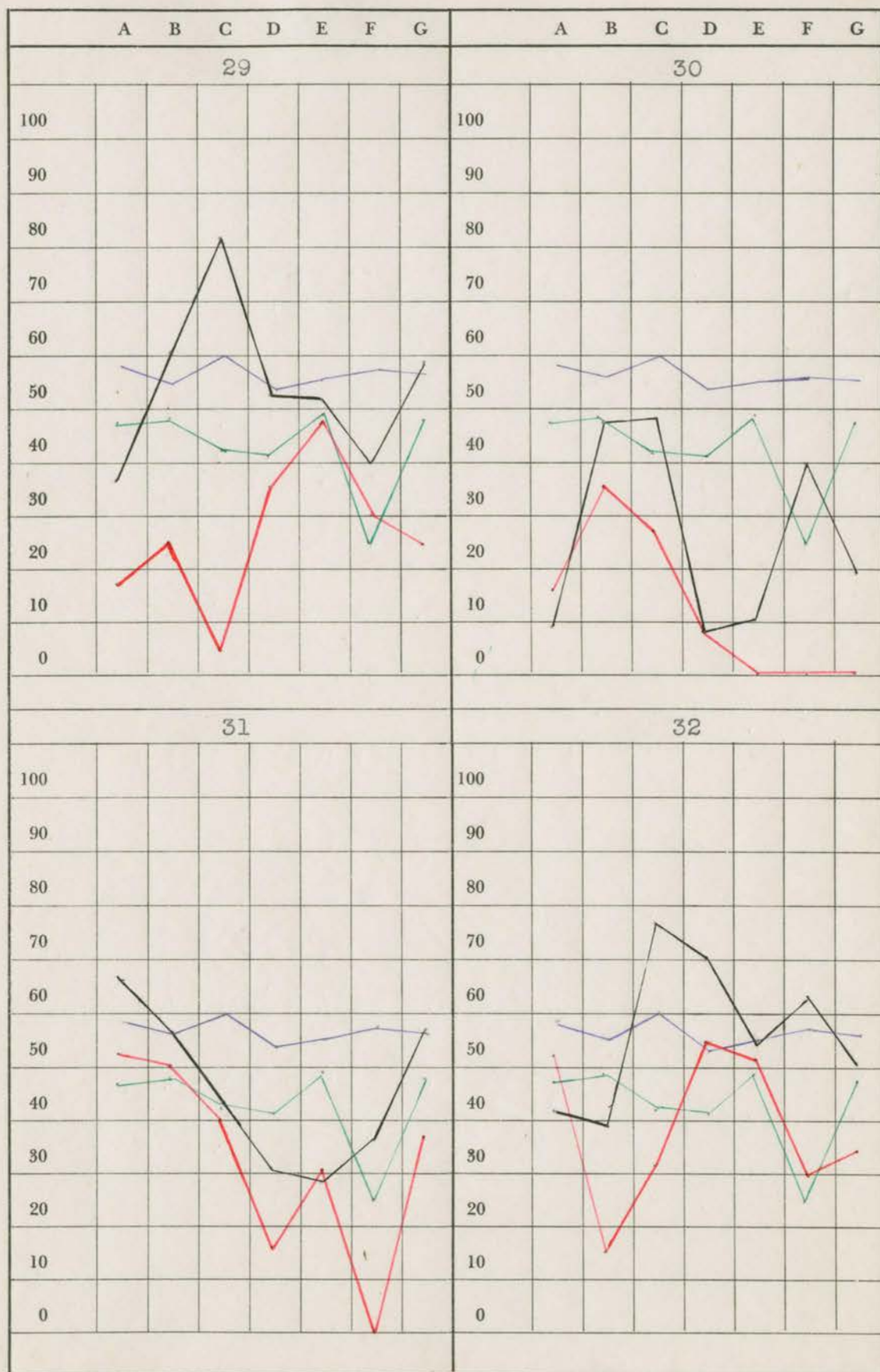


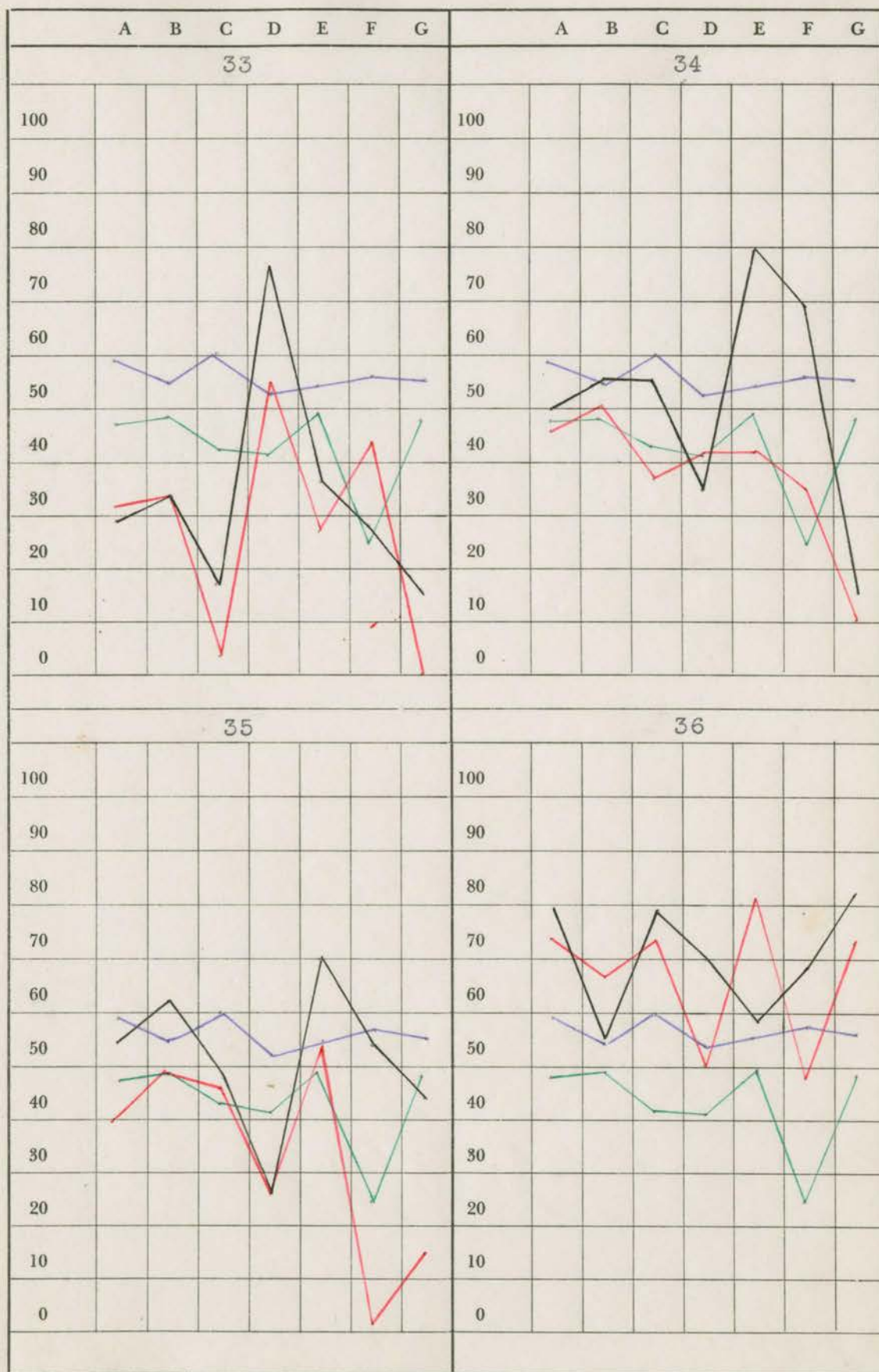


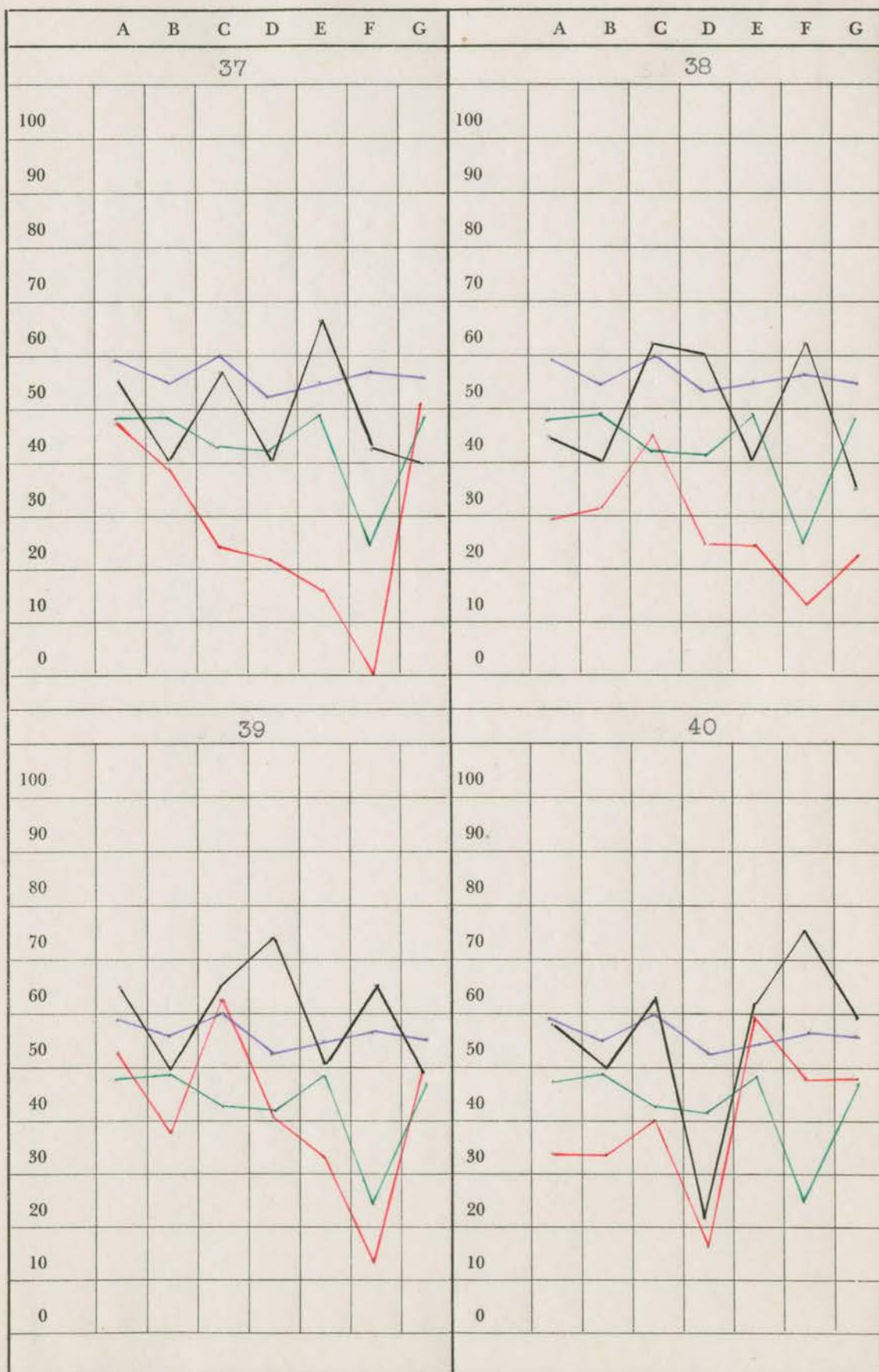


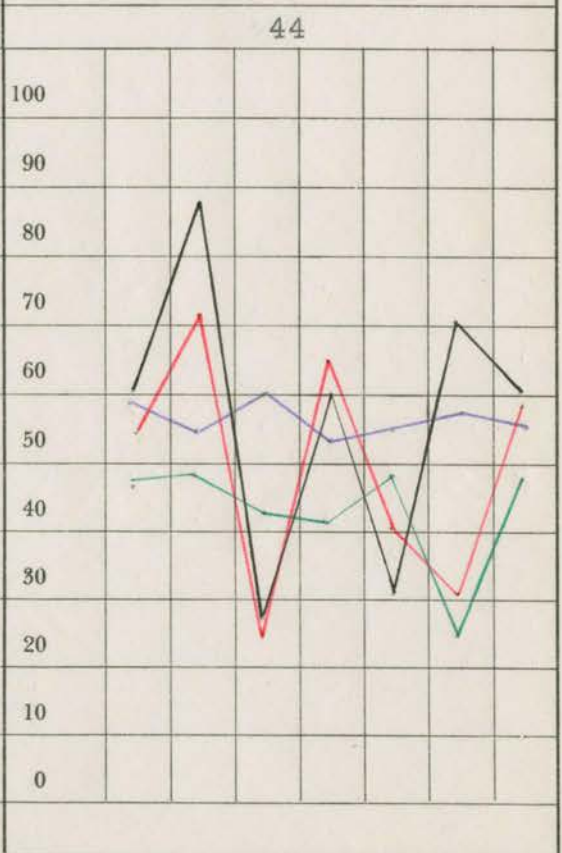
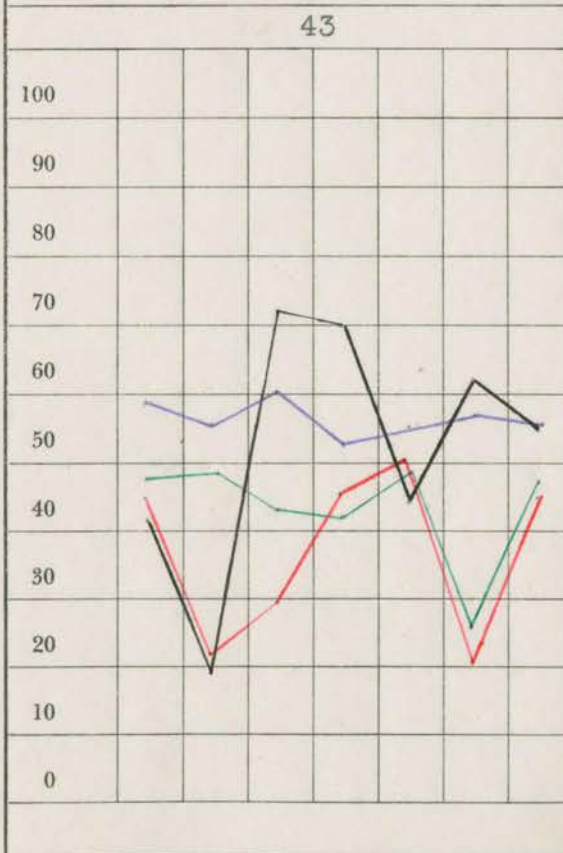
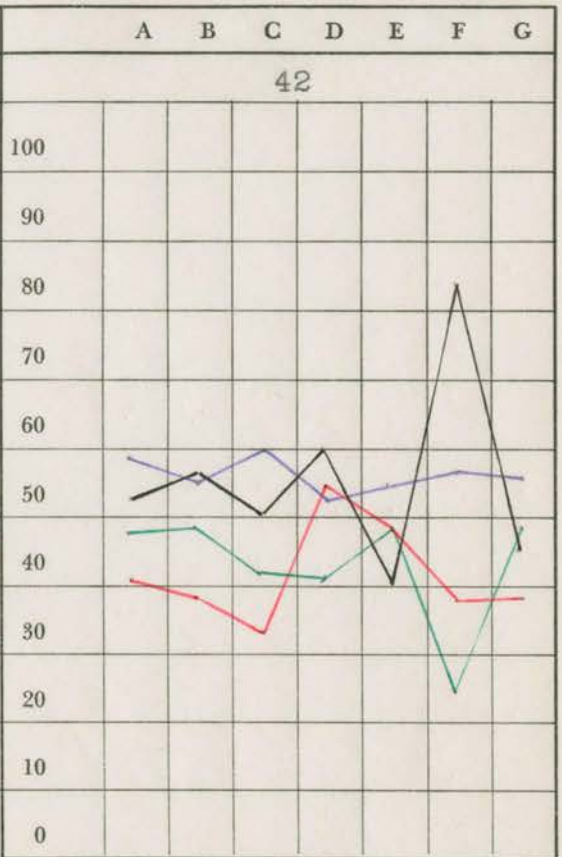
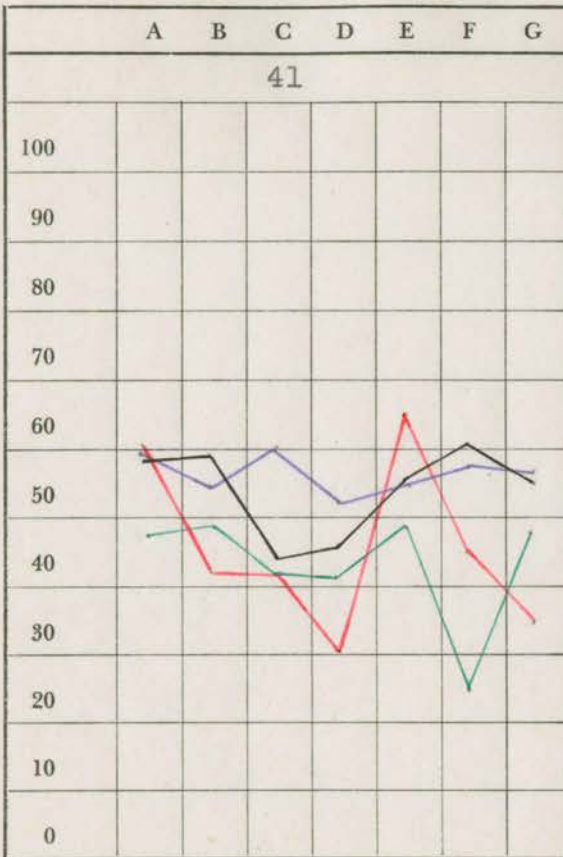


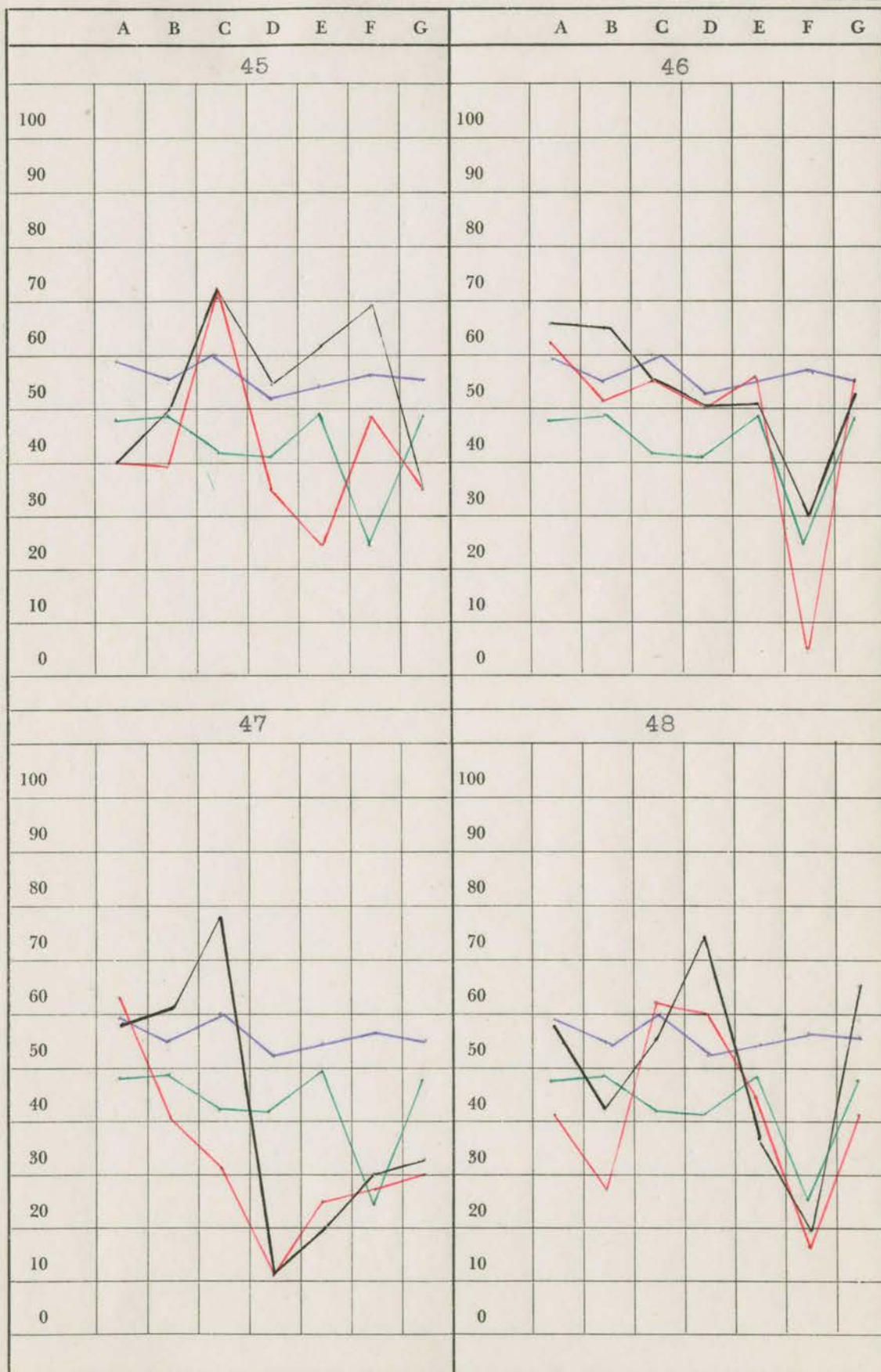


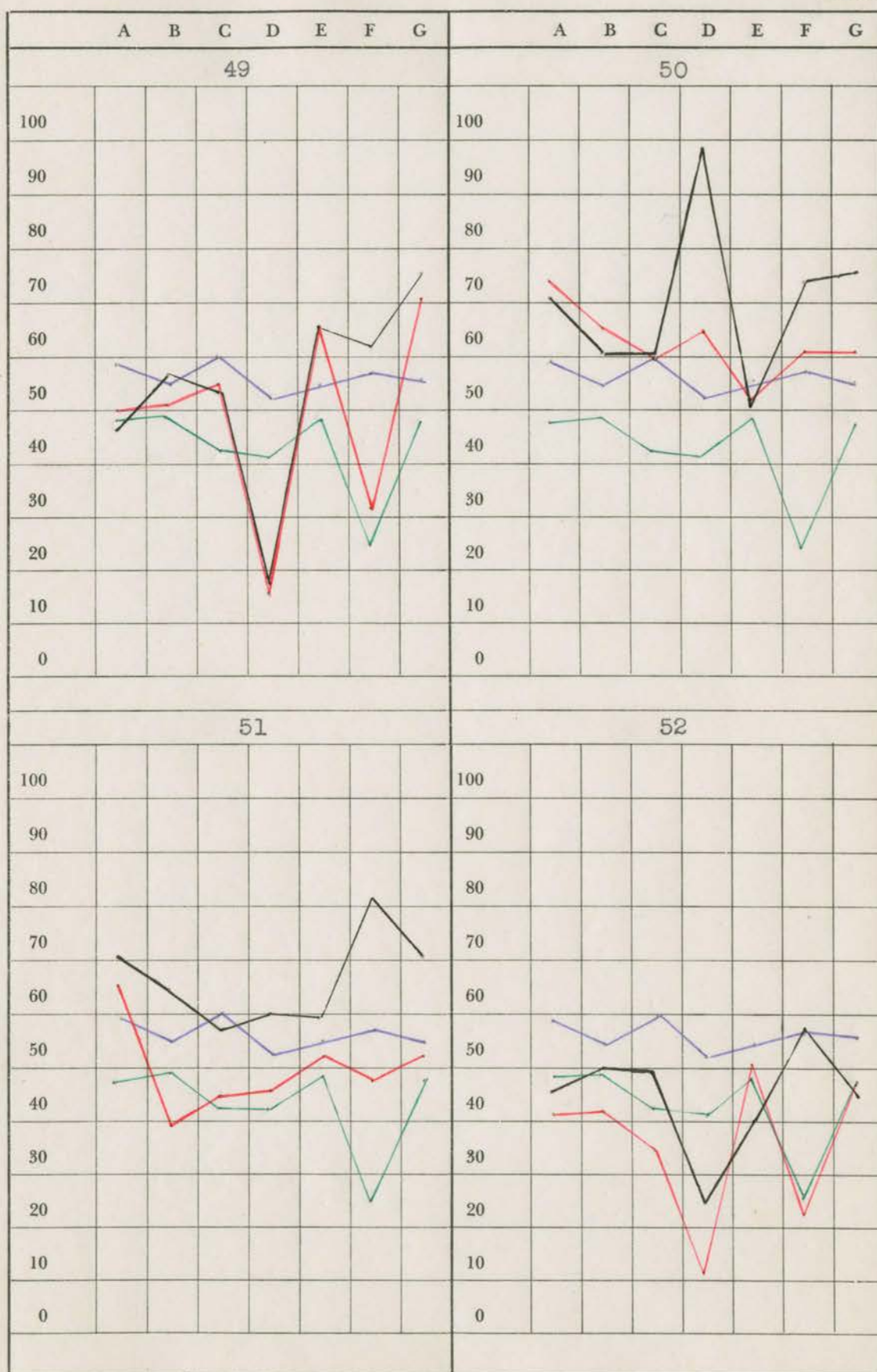


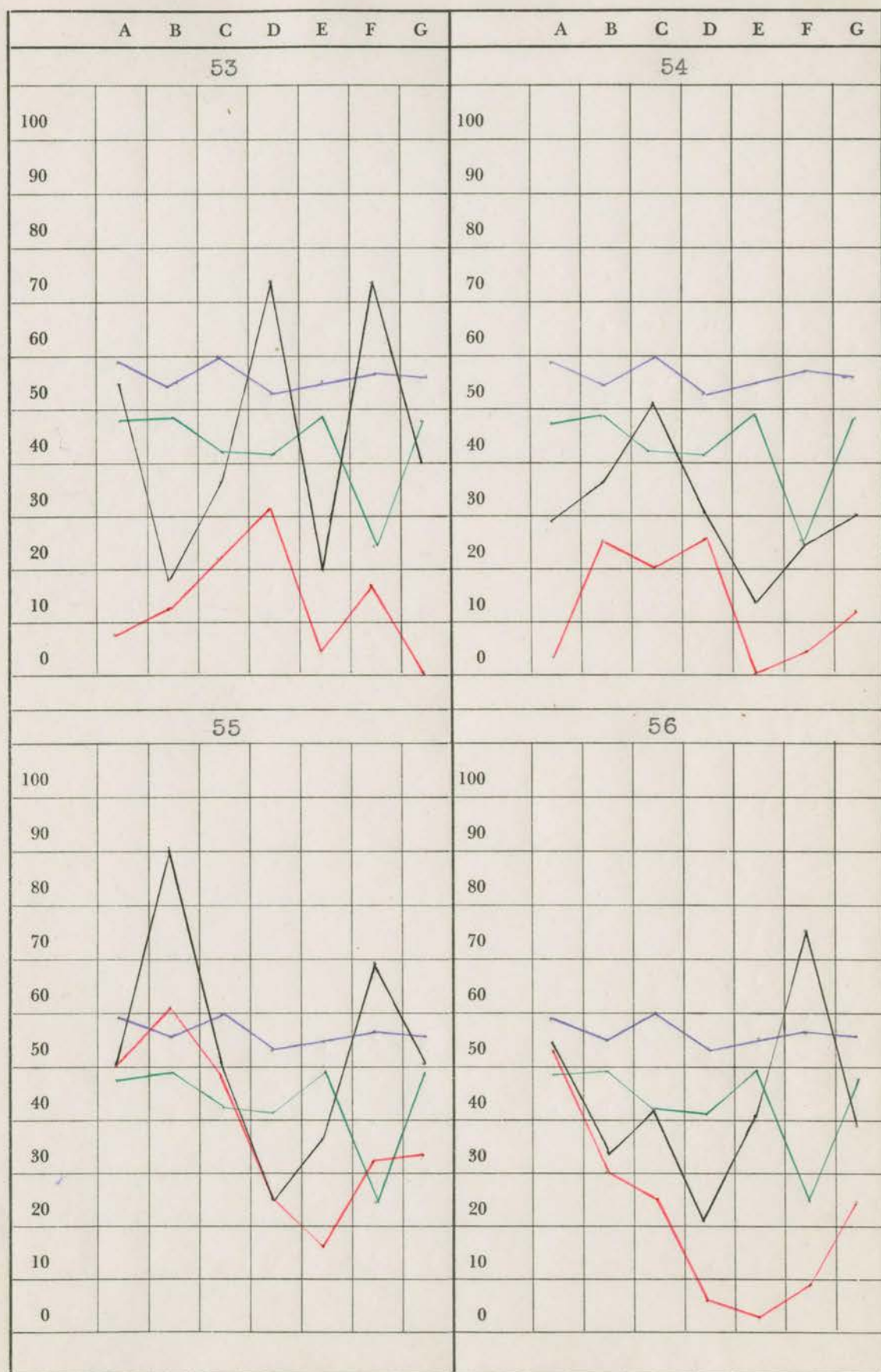


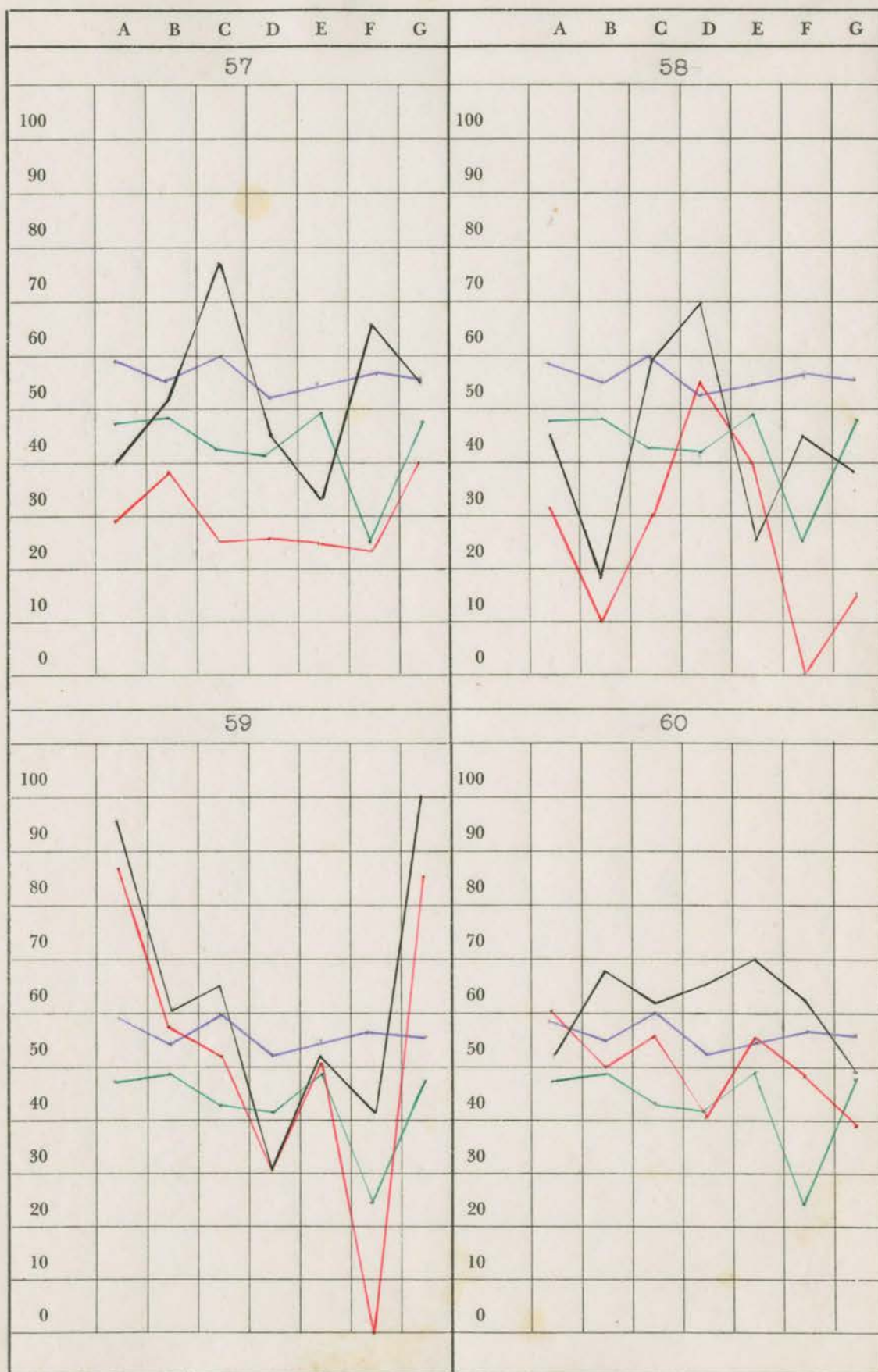


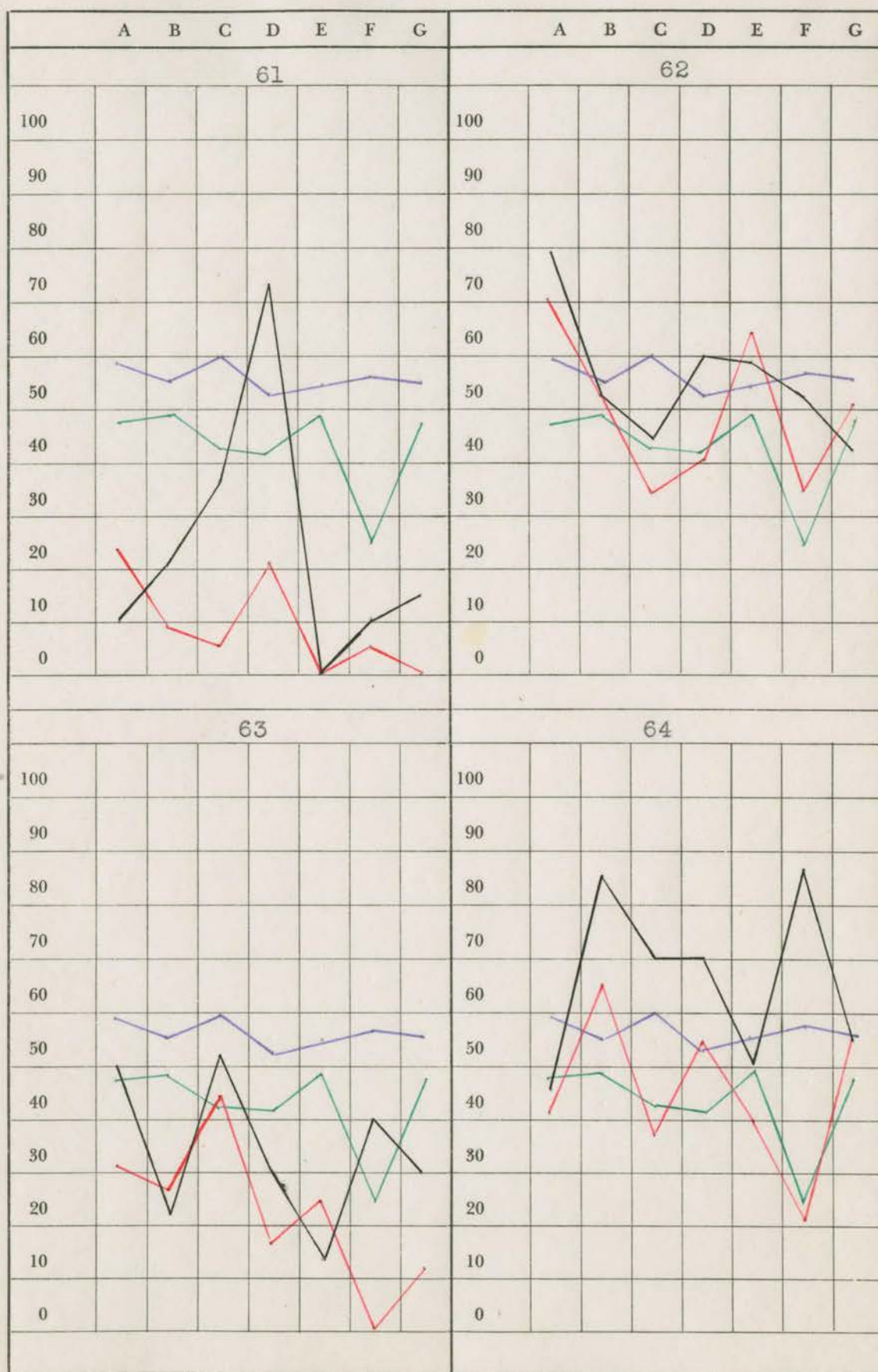


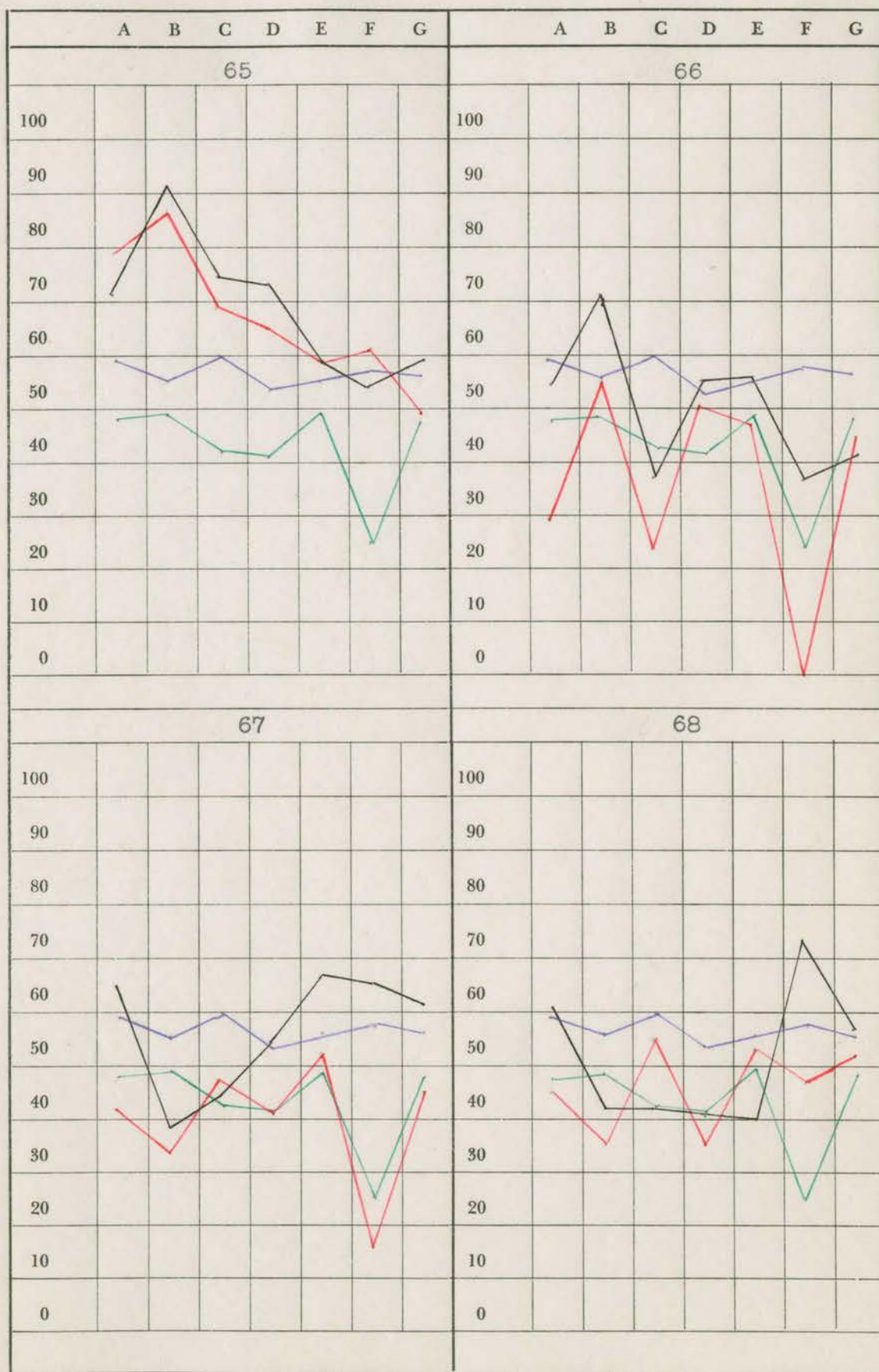


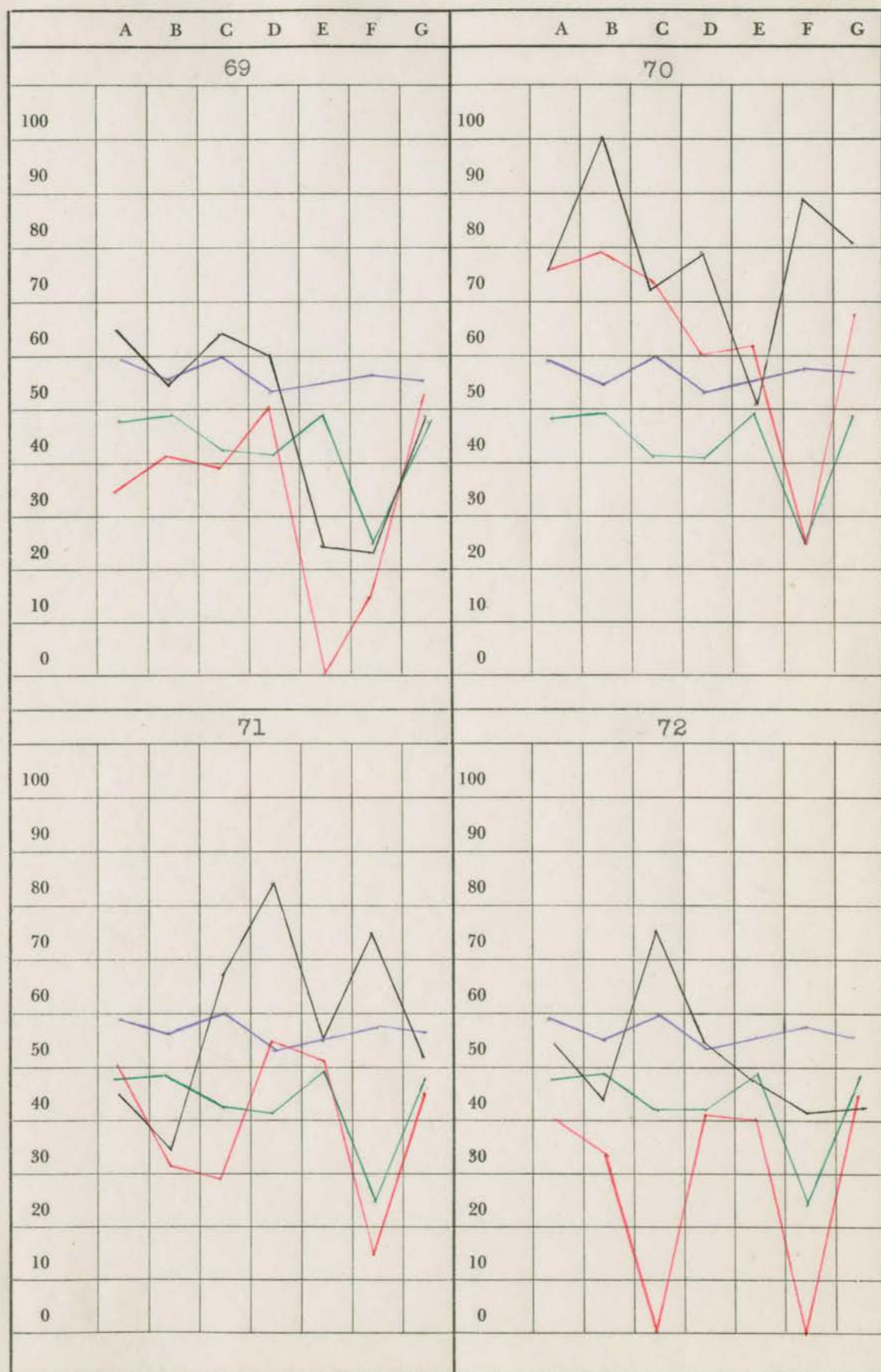


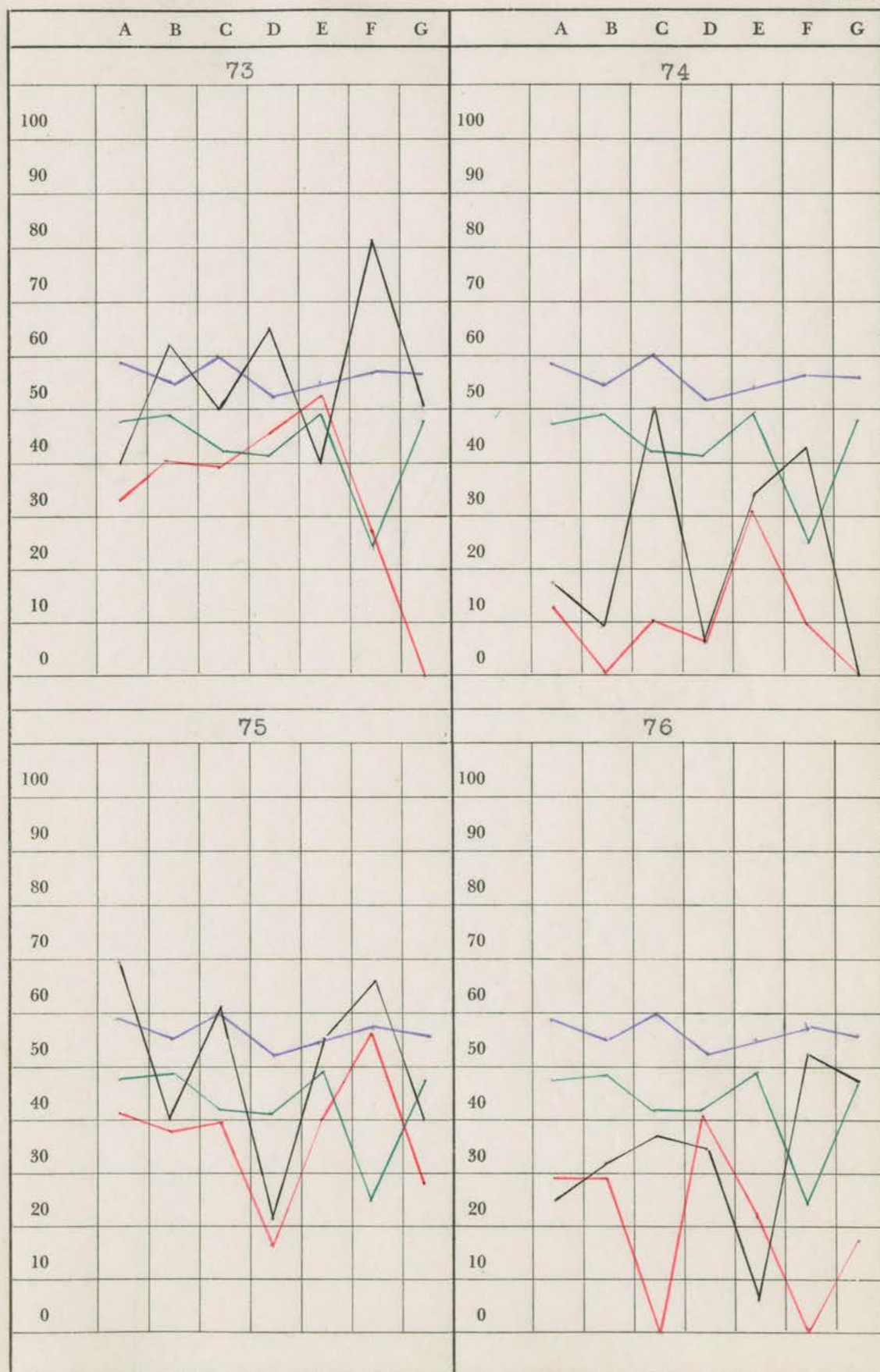


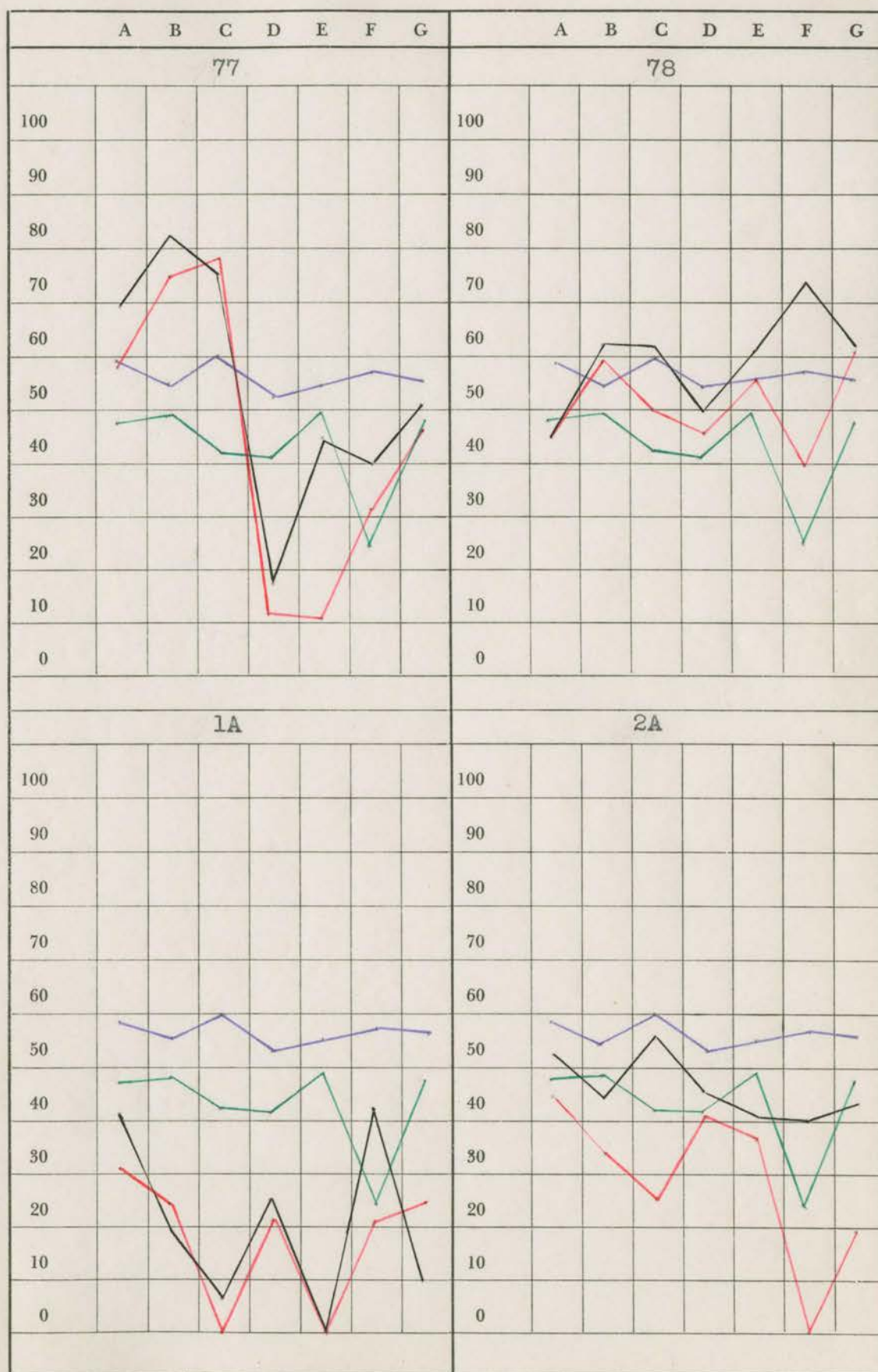


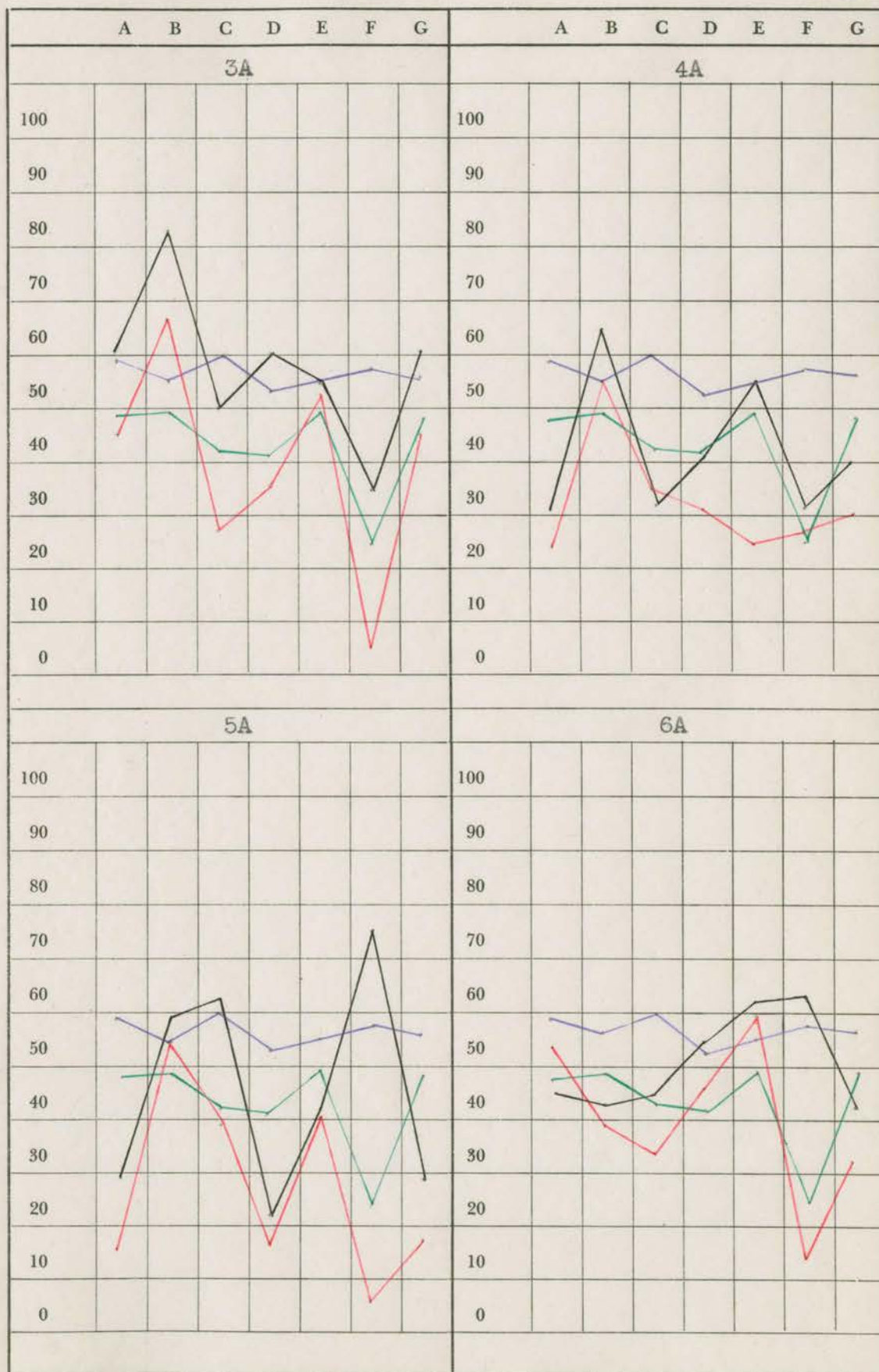


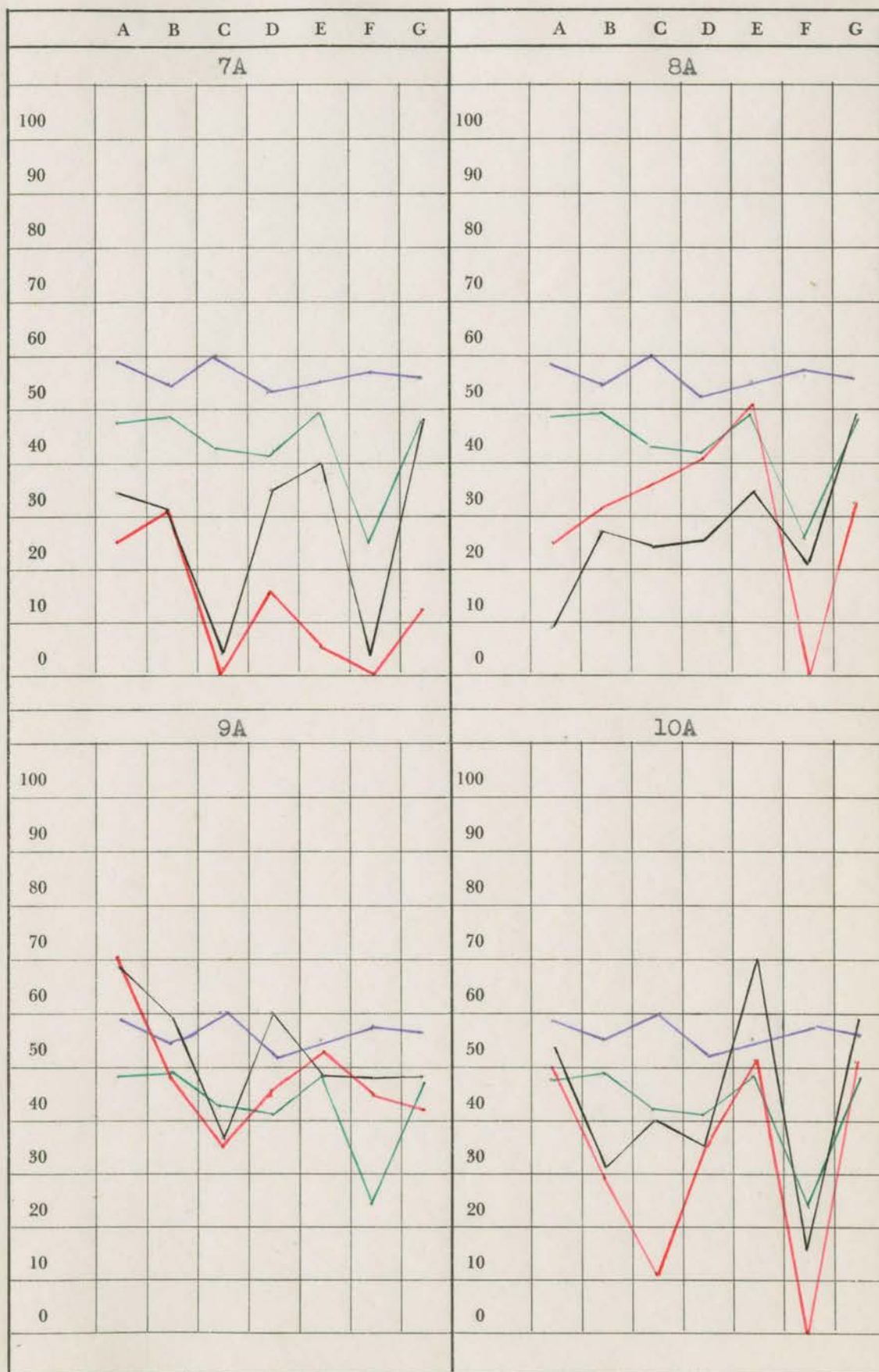


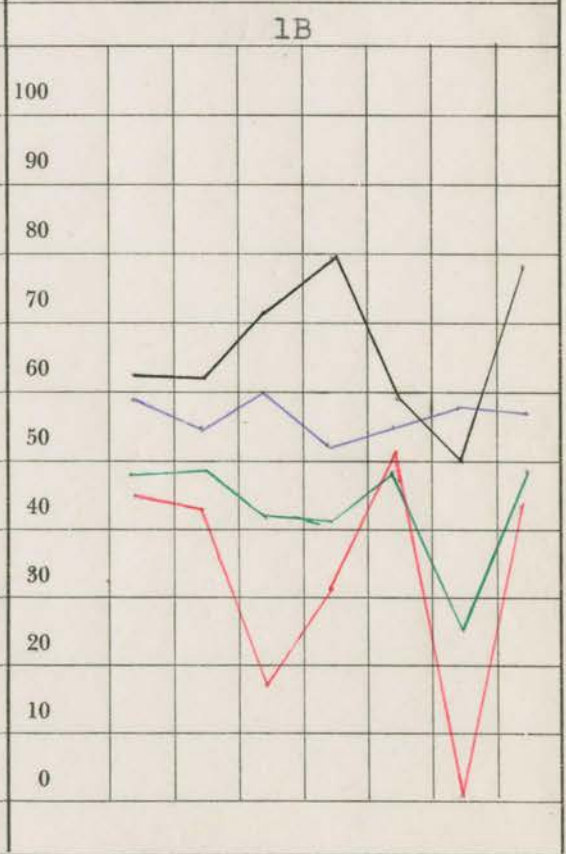
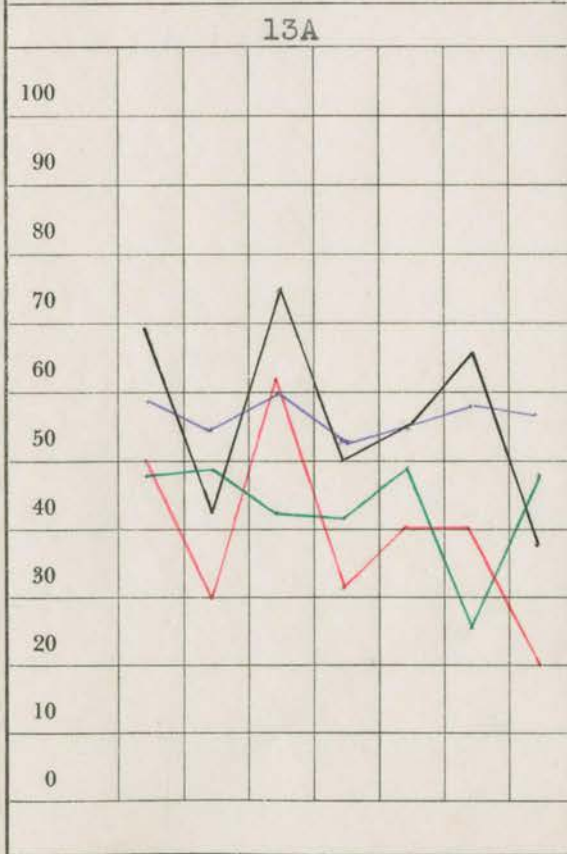
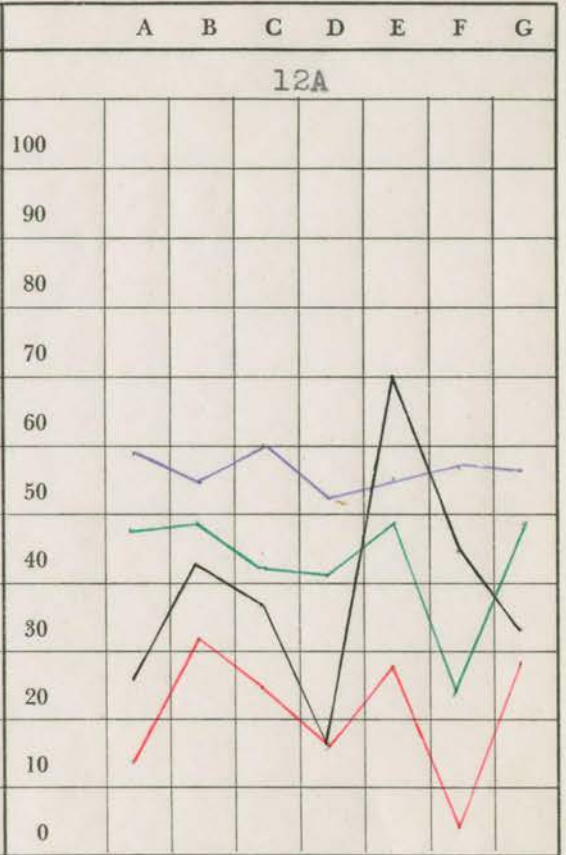
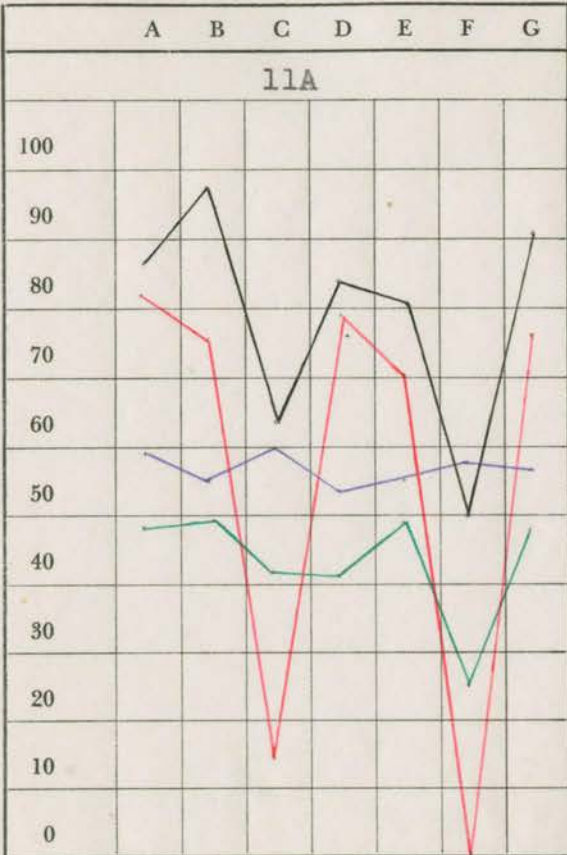


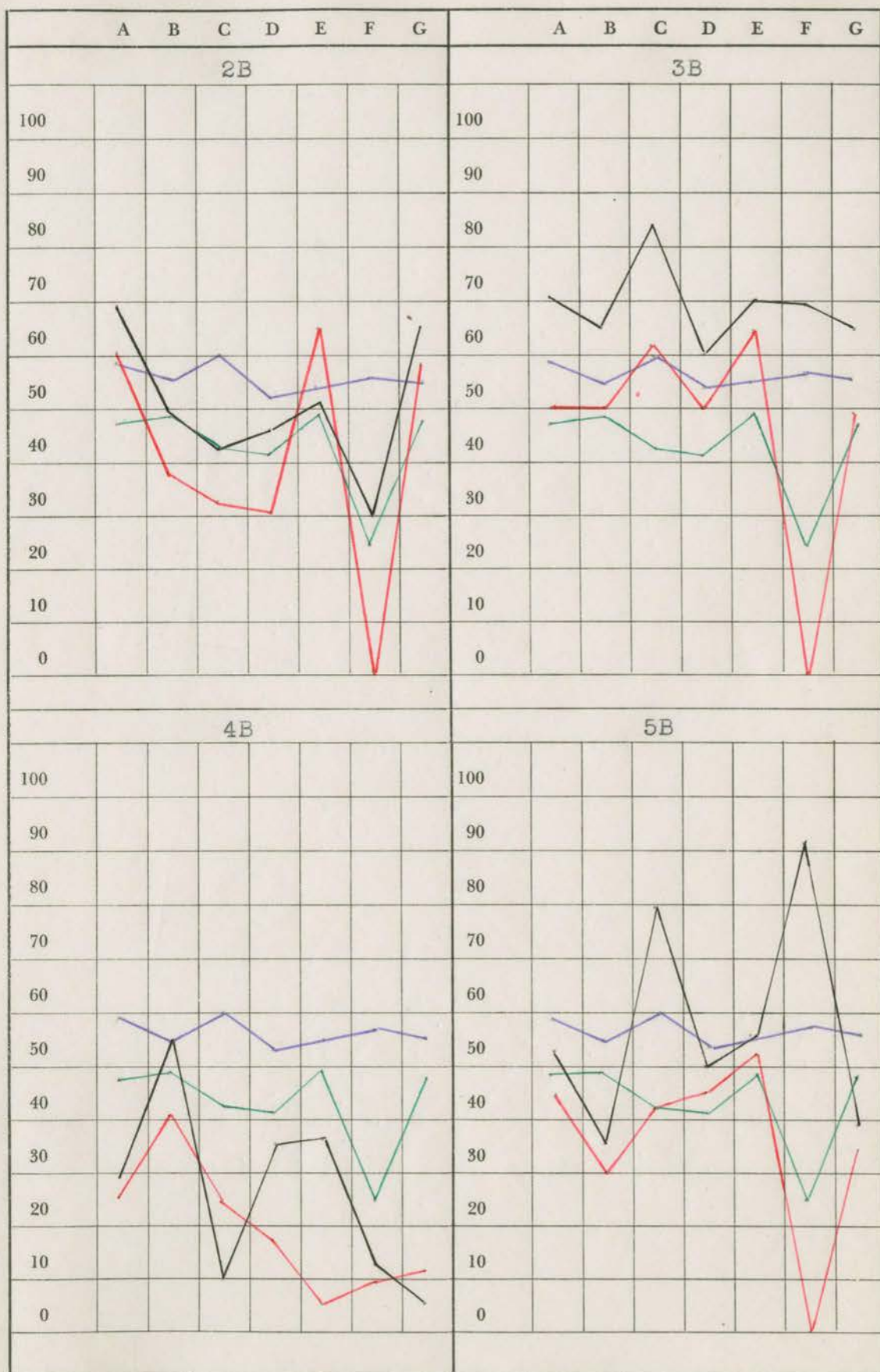


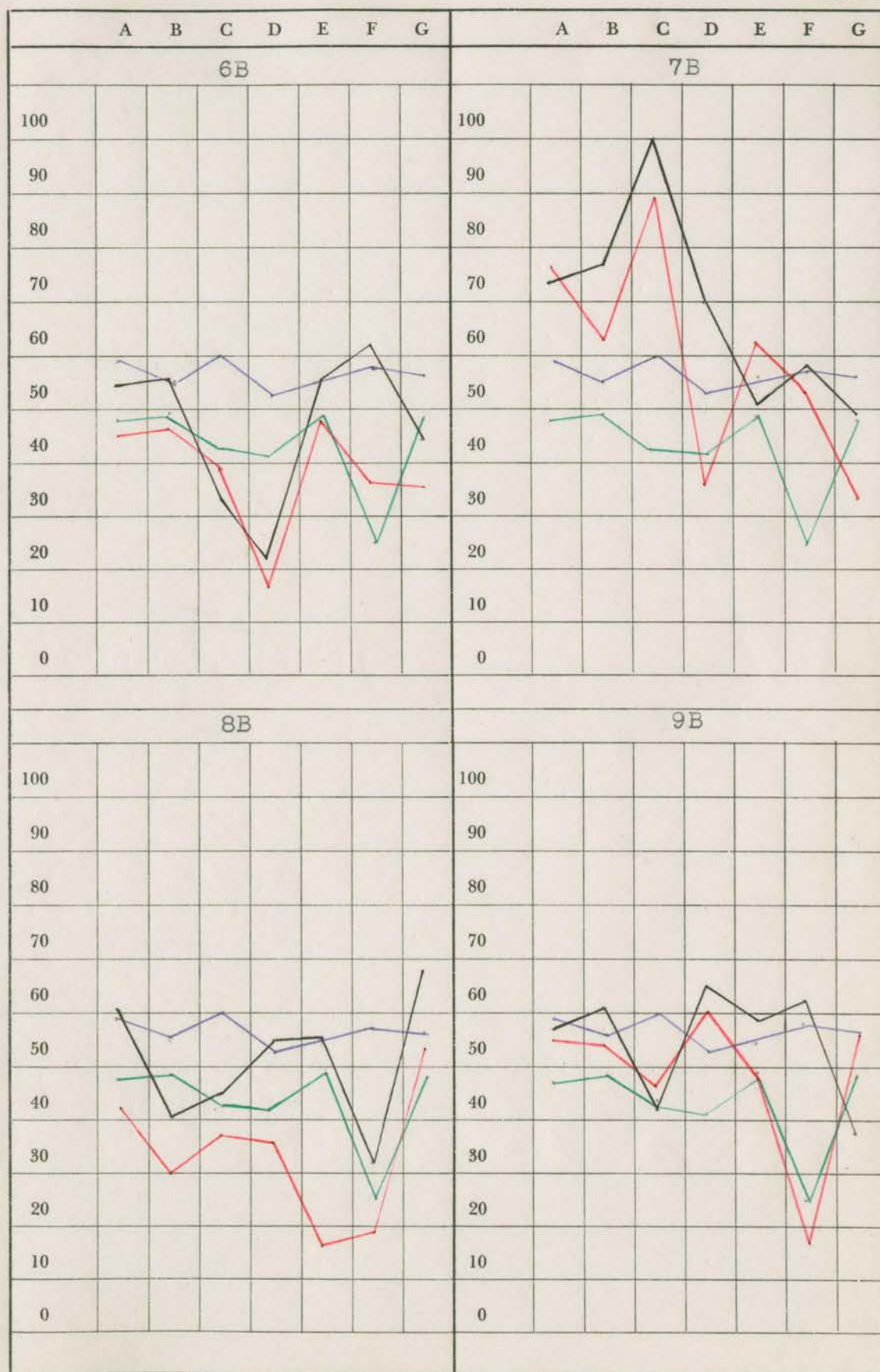


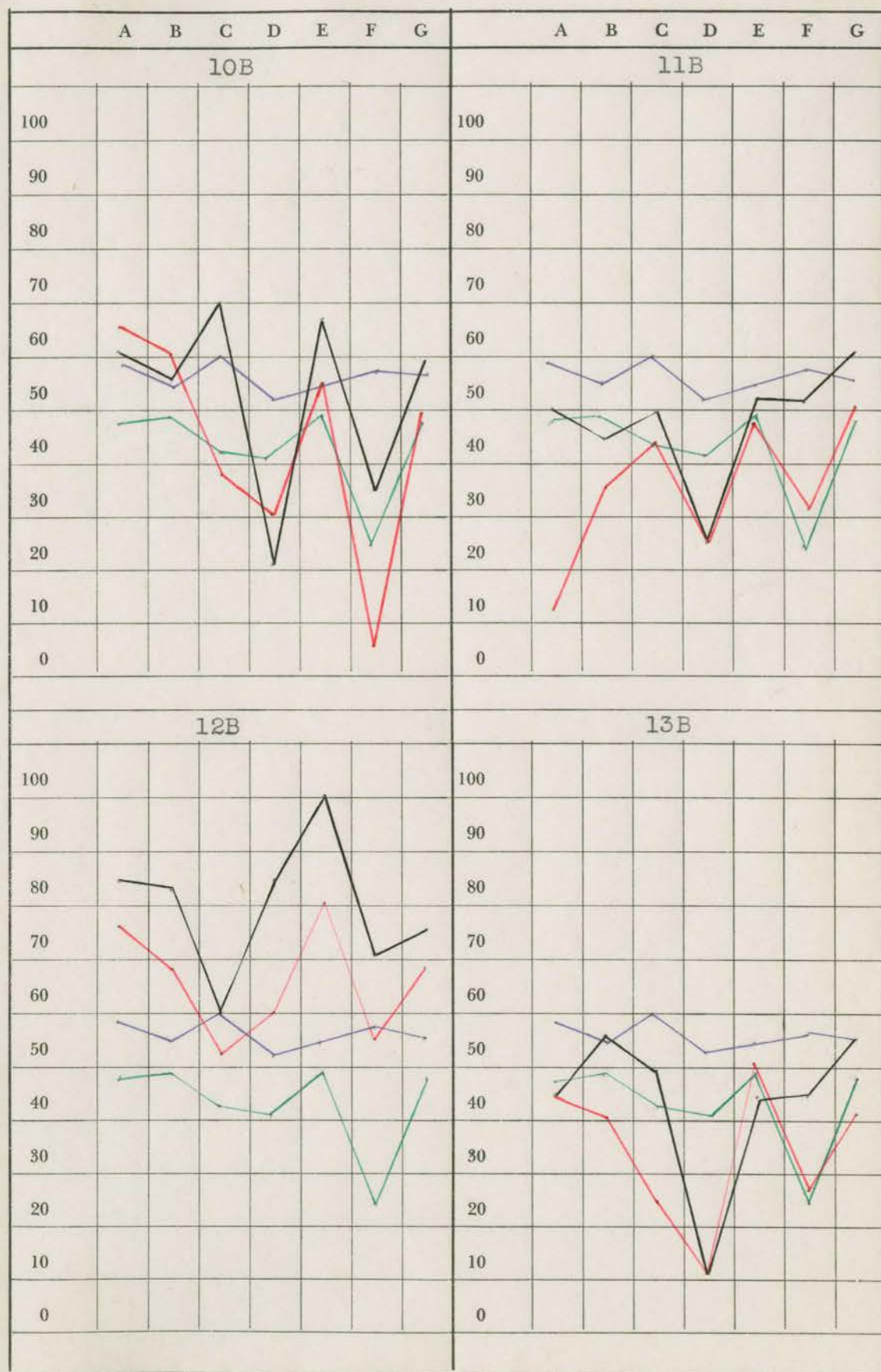


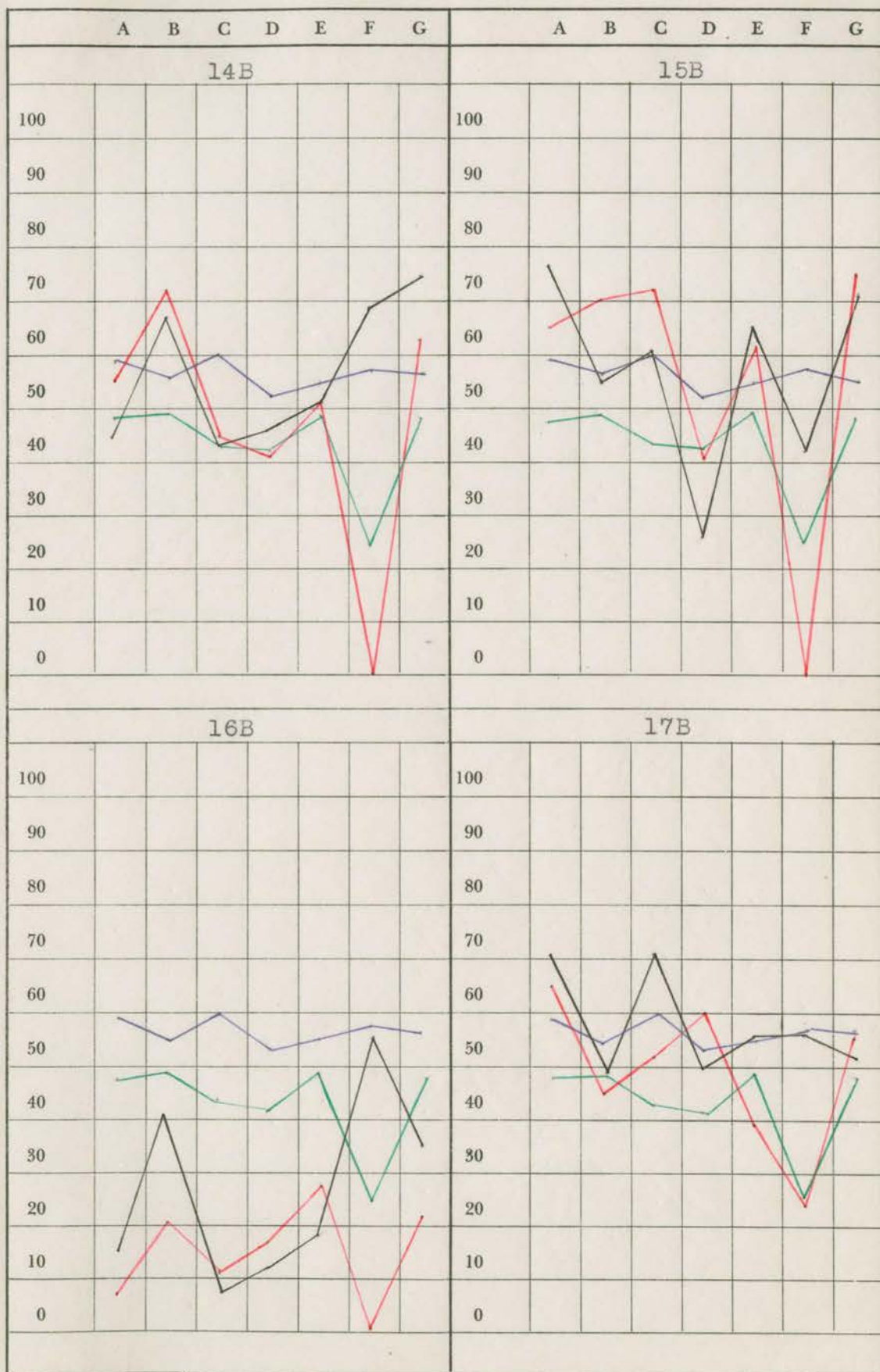


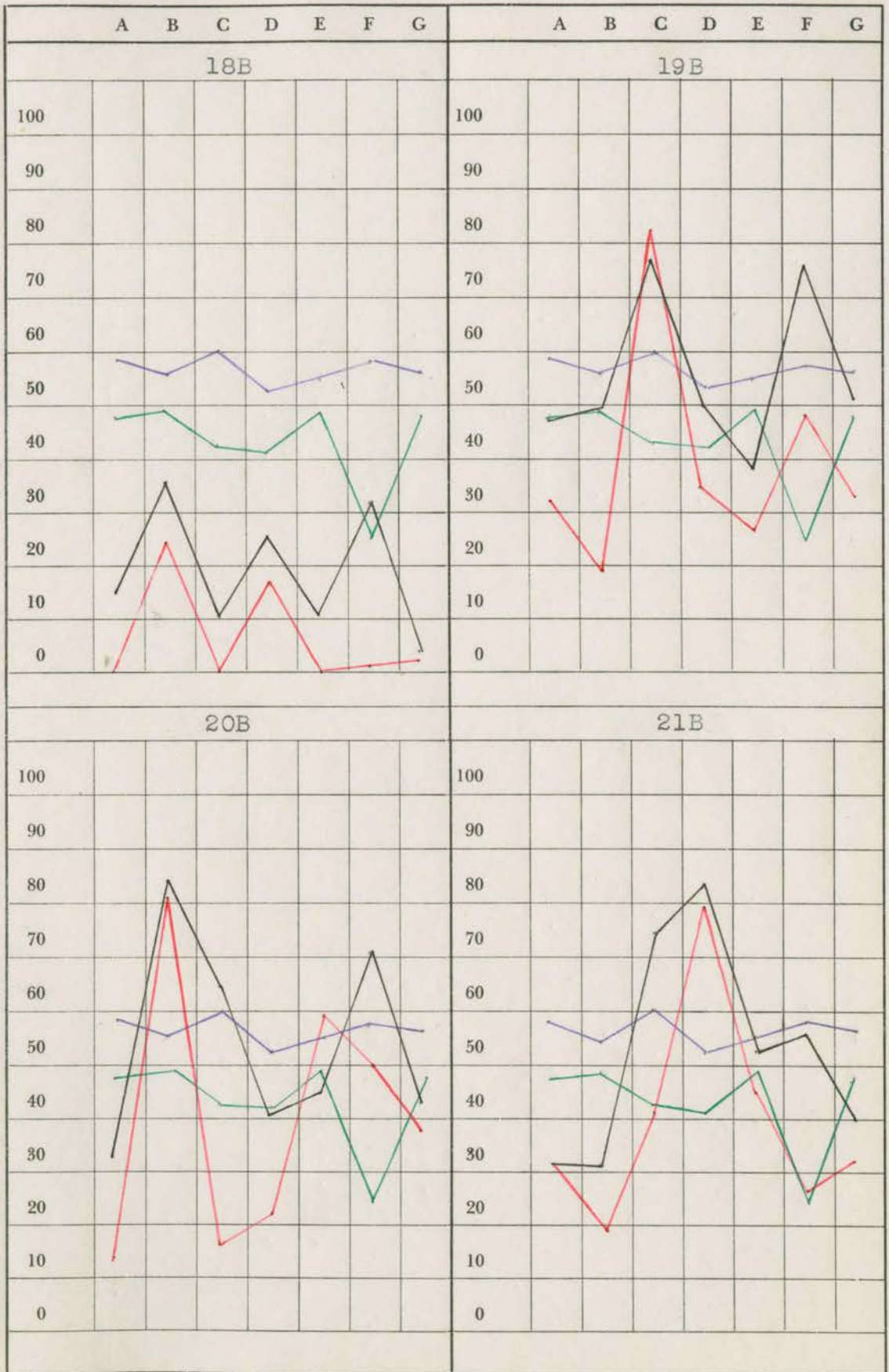


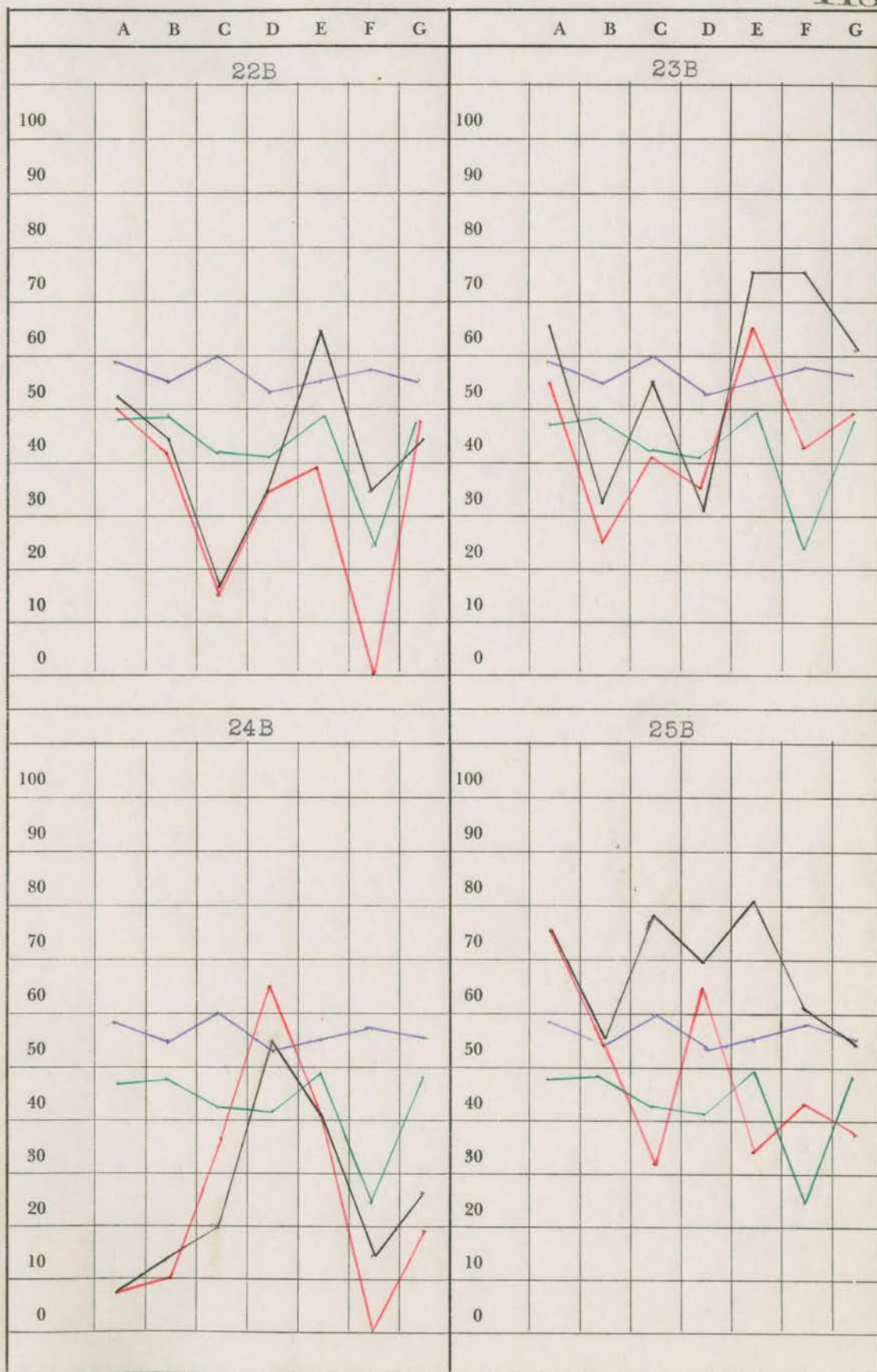


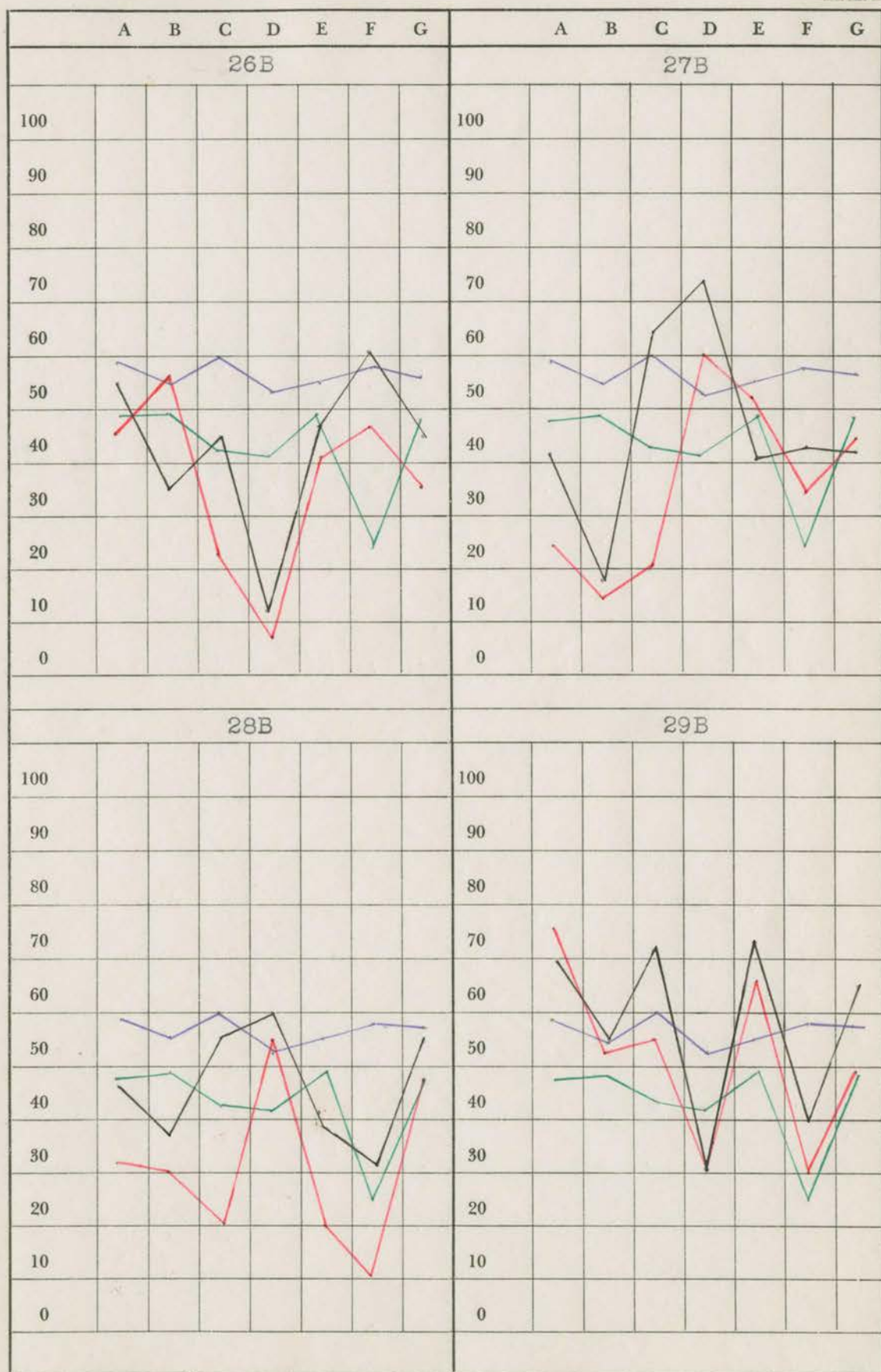


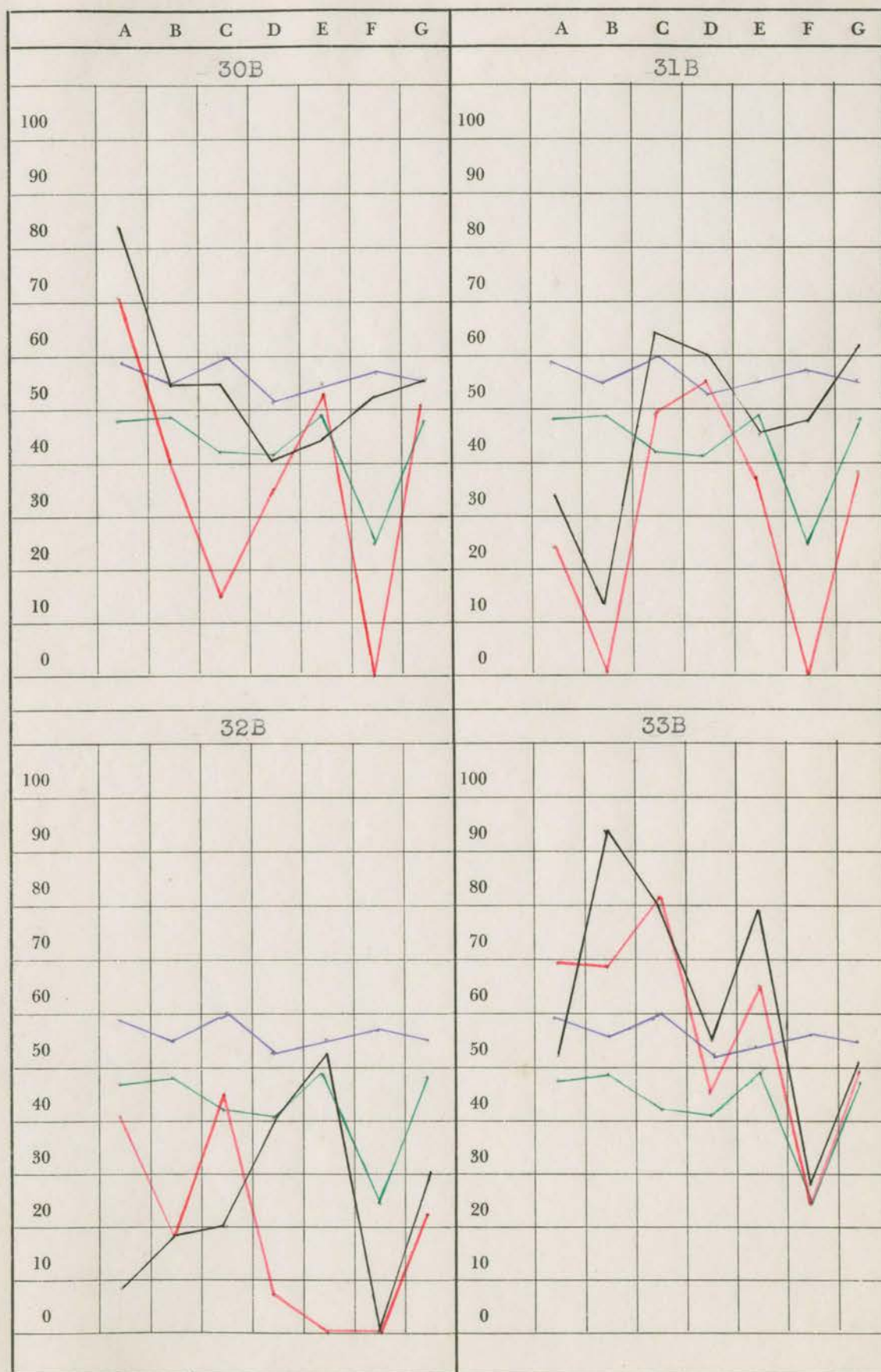


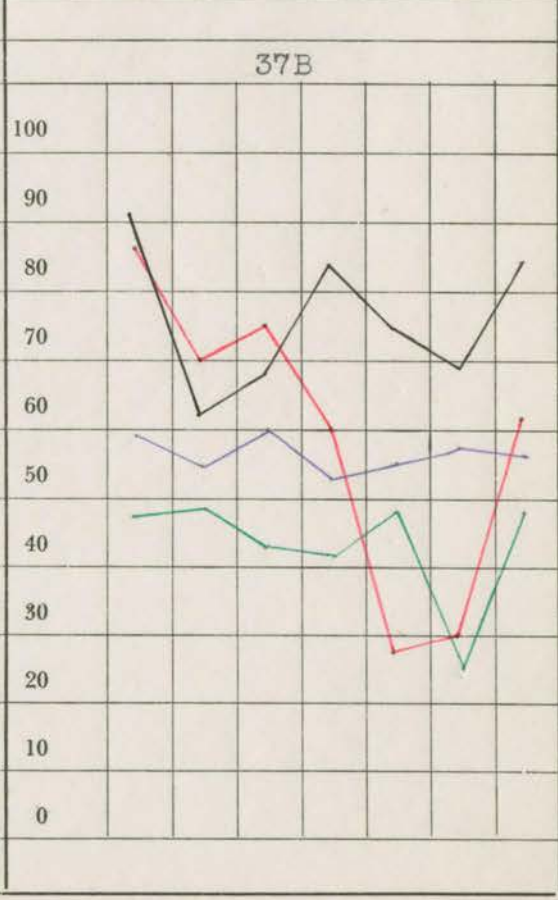
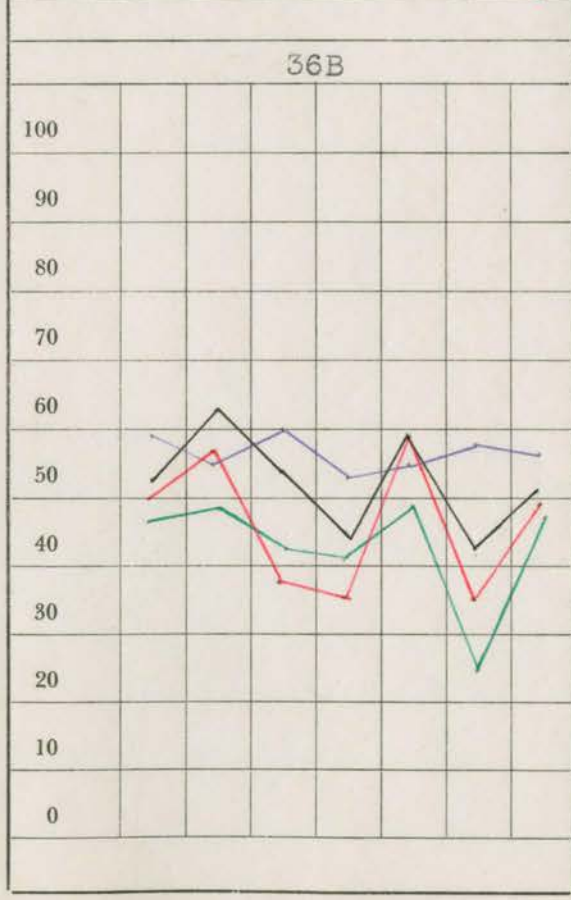
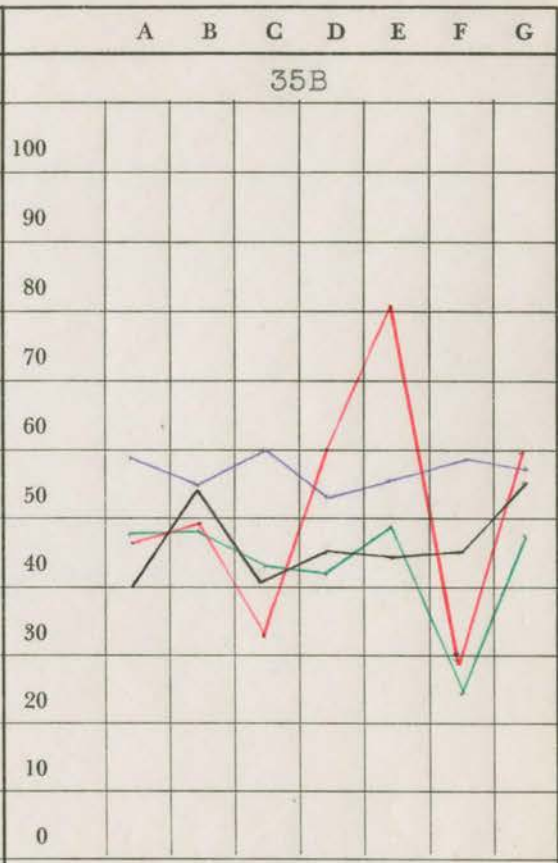
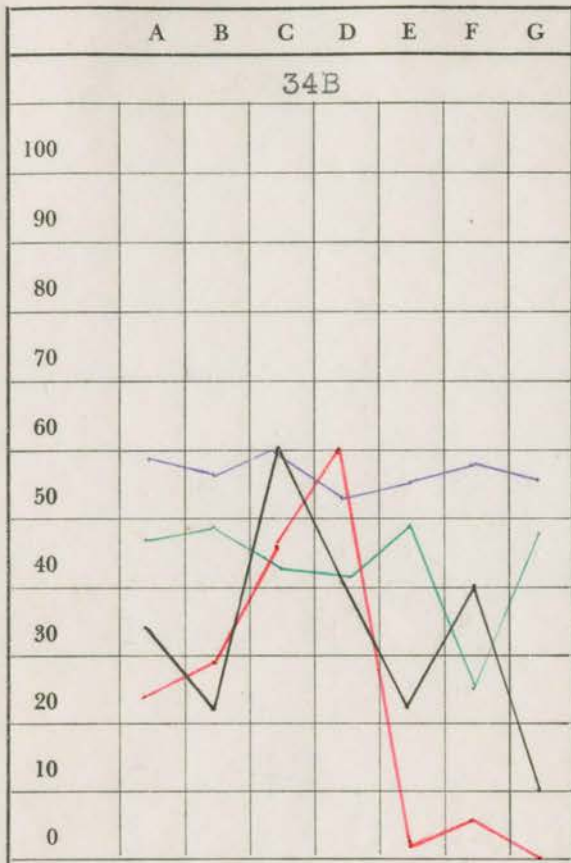


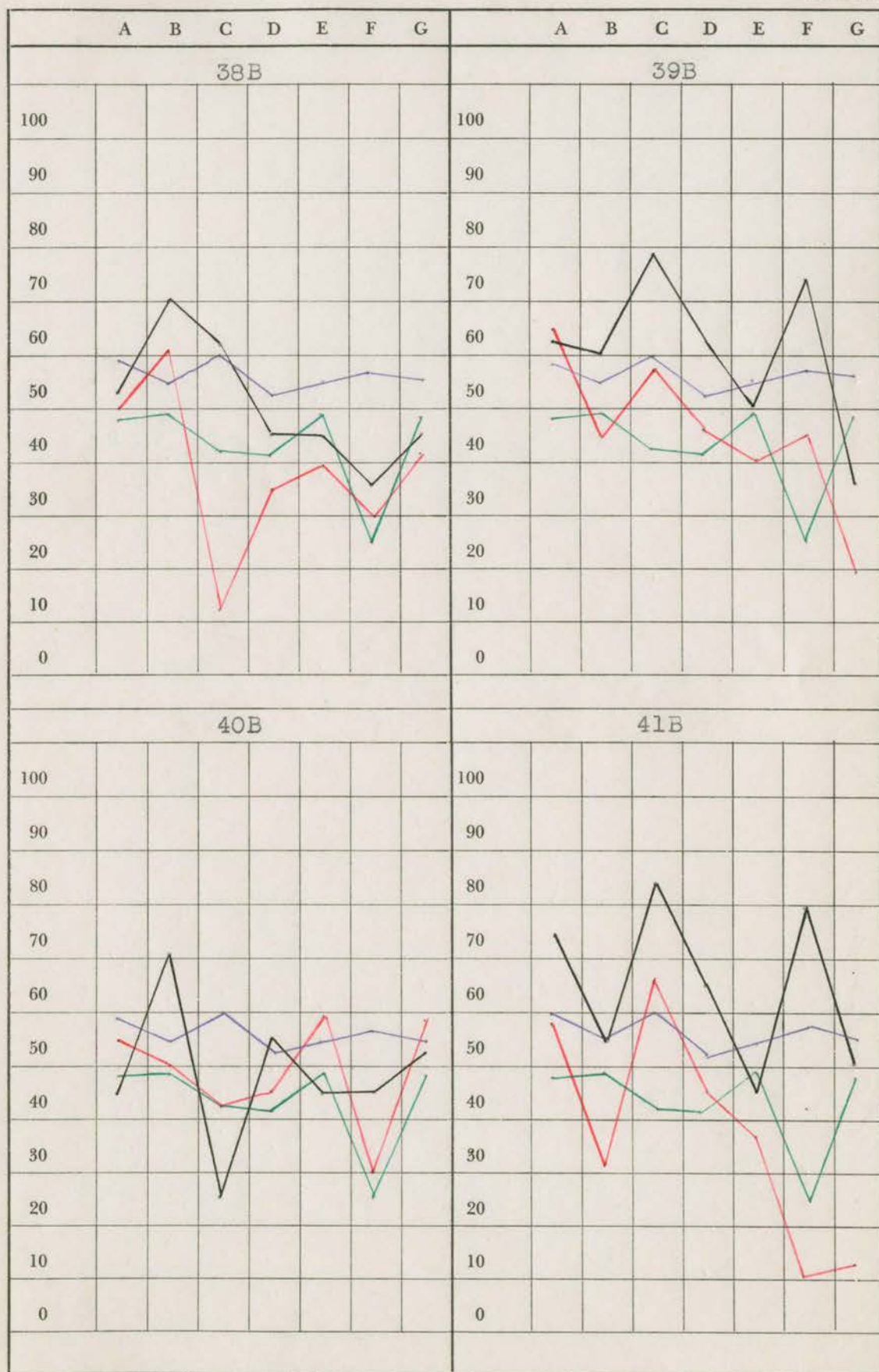


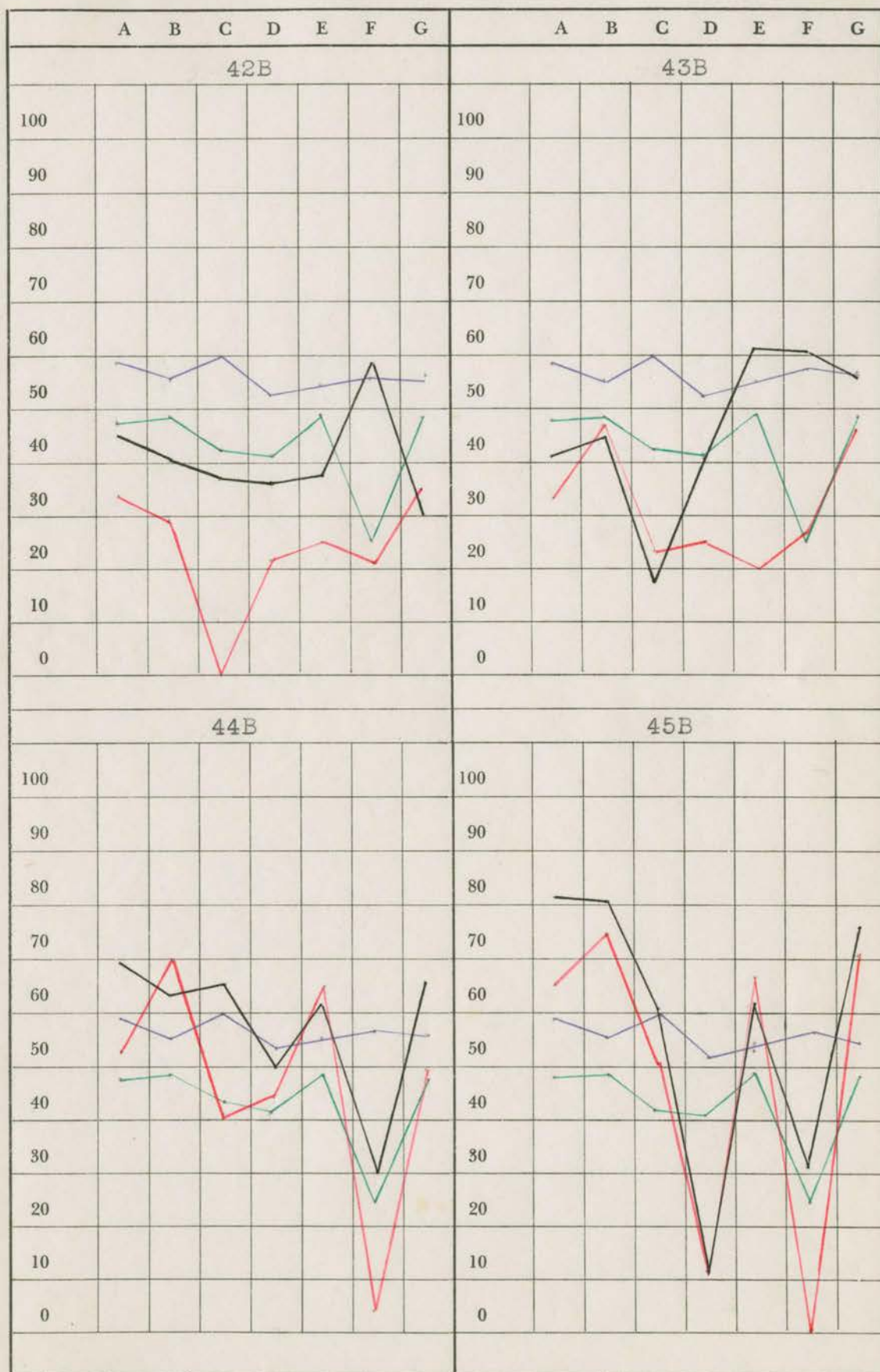












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