A study of Leisure-time interests

Pennington, A

An Enquiry into Leisure-time Interests.

Dividing the leisure-time interests of fourteen year-old boys into three groups, intellectual, active and passive, an attempt was made to find whether any significant differences of interest existed between grammar and modern school populations, and also to correlate such interests with abilities and achievement in school subjects.

After preliminary grading of all the items polarities were set up by putting

Intellectual versus Active Interests

Intellectual versus Passive Interests

Active versus Passive Interests,

and a final interest test was constructed containing these three sections. The form of the interest test was a vocabulary test employing subtests containing six items, three from each type of interest involved. The pupils had to explain three items only in each subtest, thus enforcing a selection between the two types of interest.

The interest tests, together with various ability tests, were administered at

1) an urban Grammar School

2) an urban Secondary Modern School

3) a rural Grammar School.

Spearman's split-half technique showed that reliabilities in the region of 0.7 can be achieved with this type of test, even with a short test.

Group interest scores for the three schools revealed

a) a movement from Intellectual towards Active interests
from Intellectual towards Passive interests and
from Active towards Passive interests

as one went from grammar to modern school population, and

b) a distinct preference for Active interests in the rural Grammar School compared with its urban counterpart.

The three interest tests were each found to correlate positively with tests of ability and practical ability, the coefficients ranging between about .25 and .45 , this being the order anticipated.

Factorial analysis of the tests suggested that the ability tests and the interest tests all had a positive loading for what appeared to be the general ability factor. A second factor, which appeared to be related to 'passivity' also emerged from this treatment. The possibility exists that this factor could be the reverse of Alexander's

persistence factor, an idea which received support from considering the three interest tests only.

Tests of achievement in school subjects were not very satisfactory as uniformity of marking could only be ensured for some fifty-eight boys. Such figures as were obtained, however, showed general agreement with expectations from the hypothesis that:-

intellectual ability begets intellectual interests,
general plus practical ability begets active interests,
and lack of ability results in a preponderance of passive interests.

Case studies, in those cases where the interest score in any direction exceeded 60%, offered limited confirmation of the results already quoted.

PREFACE

An educational research of a statistical nature, even though its extent be as modest as in this present attempt, cannot be carried out by the single-handed efforts of the author. It is necessary to obtain results from schools other than his own, and in order to do this the help of people in those schools must be enlisted. Throughout the whole of this enquiry such help was ever forthcoming, and I wish to put on record my sincere thanks to all those concerned.

For help with the validation tests I am particularly grateful to :-

L. Angus, Esq.	Consett Grammar School
C. Evans, Esq.	Washington Grammar School
W. Milner, Esq.	Gateshead Grammar School.
T. Seddon, Esq.	Whitley Bay Grammar School.

Thanks are also due to Professor Peel, and to his secretary, Mrs. Gibson, for help in typing and duplicating the tests.

To the Headmasters of the schools at which the final tests were presented, and to members of their staffs, I express my gratitude. They were :-

A.K.Wilson, Esq.	Dame Allan's School.
F.Mosby, Esq.	Duke School.
J.Spark, Esq.	Ralph Gardner School.

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To my own Headmaster, Mr. Wilson, I owe special thanks for his unobtrusive interest and encouragement, and for numerous concessions which simplified the production of the final interest test.

I must also thank Mr. Bosomworth, of the Northumberland Education Authority, for effecting very useful introductions.

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T.S.Percival, Esq.

D.S.Walker, Esq.

Finally I must thank again Professor Peel of the Department of Educational Psychology at Durham University without whose constant encouragement and guidance the work must have come to nought.

A study of various types of leisure time interests among boys at about 14 years of age, leading to :-

a) a comparative study of such interests among Grammar and Secondary Modern School pupils, and to :-

b) an attempt to correlate these interests with specific abilities and achievements.

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INTRODUCTION.

ORIGIN AND OUTLINE OF THE PROBLEM

In any school staff room loose statements are invariably made relating a boy's shortcomings in school subjects to his out-of-school activities. Some will maintain that, for example, "the members of the football team are always poor in school work". At the other end of the scale the writer knows one teacher of many years' experience who firmly avows that "our university scholars are always good swimmers".

Similarly parents, too, are apt to blame their children's scholastic failures on their hobbies and amusements. "If our Johnny would spend more time on his books and less on his bike ..... " is a not infrequent complaint. The vast majority of these statements are made by people who are basing their judgements on very small numbers, especially in the case of parents. Often, too, their outlook is clouded by a considerable amount of personal bias. Few parents care to admit that their offspring might not be academically bright, and few teachers can justly claim to be

completely neutral in their feelings towards these defaulters.

Since academic success is still the hall mark by which many people judge a school career, it may be of some value to find out whether or not various types of pastimes bear any relation to results in school work. Whilst a considerable amount of work has already been done in the field of interest testing (a review of which will be given later) no general attempt seems to have been made to link a child's amusement interests to his school progress, his academic ability or his intelligence. Whilst it is fully realised that the contribution which can be made by one person to such a wide topic is quite inadequate, if only on a statistical basis, yet it is hoped that the outcome may give some indication of general tendencies, if such exist.

With the coming of the General Certificate of Education a tendency is arising in many Grammar Schools to make a decision after three years of Grammar School education as to what group or groups of subjects a pupil should pursue. The rights and wrongs of such a decision at such a time do not form part of this thesis, but if such a choice is going to be made it would be of some value to know if leisure time interests can be of any use in helping to predict which course of study is likely to prove most profitable.

In general, then, the object of the enquiry is to see if leisure time or amusement interests bear any relation

to a child's achievement in school subjects, or to his ability as measured by standard tests, and to see if a knowledge of such interests is likely to be of value in predicting success in any academic field.

The Significance of Interest in Educational Theory

As in many other fields where results can only be assessed by long term observations general educational practice has, more often than not, been many years behind educational theory. Even at the end of the nineteenth century the more enlightened ideas of Locke, Rousseau, Pestalozzi and others were far from replacing the older view that the child was "a miniature adult - a man 'writ small' ".[1] Many schoolmasters were still in agreement with Armstrong in asserting that "it does not matter what you teach boys as long as it is sufficiently unpleasant". The possibility of a child requiring different activities at different stages and so progressing steadily to the adult state was not entertained. The task of the educator was to force the child into the adult pattern as quickly as possible. Under such circumstances the individual interests of the pupils were more likely to be crushed than encouraged.

Alternatives to this "forcing" method had been proposed from time to time by various people interested in educational problems.[2] Rousseau was by no means the first, but his "Emile" has had a very large influence on educational

[1] A Short History of English Education, H.C. Barnard. Chap.IV, University of London Press, Ltd.

[2] "Emile or Education" - J.J. Rousseau, Everyman's Library, Dent.

thought and practice in this country. Perhaps its exaggerations and paradoxes made a more violent impression than a more coldly reasoned treatise would have done. Primarily Rousseau stressed that education is the developement of the individual from his own natural talents. Such a process, he insisted, must be progressive, although he himself divided the intellectual developement of the child into three sharply defined periods. Along similar lines Pestalozzi[1] developed his ideas on education, the developement and cultivation of the possibilities native to the human being In other words the child must be developed from within, he must be encouraged in the right forms of self-activity and, according to Herbart[2], "interest means self activity". Nunn[3] also asserted that "it (education) enables him to express himself in activities that have an ever-increasing value", it was to be the means of creating and cultivating interests.

A comparison of the methods employed by teachers in present day schools with those widely used at the end of the last century is sufficient indication of the success of the new educational doctrine. Its exposition by Spencer[4], Dewey[5],

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① Leonard and Gertrude
How Gertrude teaches her children } Pestalozzi

② Letters and lectures on Education J.F. Herbart
Chap.IV, Para.71. Swan Sonnenschein & Co., Ltd.

③ Education. Its Data and First Principles. T.P. Nunn.
Arnold, p.35

④ Education. H. Spencer. Thinker's Library, 1929.

⑤ Interest as related to Will. J. Dewey.
University Chicago Press, 1903.

①Nunn, amongst others, has produced in schools a consideration for the interests of the individual child. The changeover from drudgery to drive in school work has been accomplished, since a child, once his interest is aroused, will make tremendous efforts to attain what he himself considers to be a worthy goal. ②"When a pupil co-operates willingly he learns twice as fast and with half the fatigue."

In this investigation we are concerned not so much with the theory of interest in teaching method as with the interaction between those self-activities sponsored outside the school and progress made in school. Do certain pastimes and hobbies foster interests which are similar to those generated by certain groups of school subjects? Or possibly the question should be stated the other way round. Experience gained by a child out of school hours is just as much part of his education as that gained in school, its effect indeed may be more lasting. Can we say, then, that it would be beneficial for parents and others to attempt by unobtrusive means to develop a child's interests in certain directions and to curtail them in others?

Psychology of Interest

The nature of interest and knowledge of the factors which enhance or impede its growth is then of considerable

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①Ibid

②Education and Civilisation B. Russell
New Statesman, May 1934.

importance in Educational Theory. Ideas on this subject have changed considerably from time to time. The Intellectualist doctrine of interest put forward by (1) Herbart suggests that interest in some particular object depends on knowledge of that subject, or at any rate on previous ideas relating to the object. This view makes it difficult to see how interest arises in the first instance.

More recent workers tend to take the view that interest has its foundation in instinct rather than in intellect. (2) Thomson says that " The Herbartian view of the growth of interest makes the whole matter far too exclusively an affair of the intellect instead of it being to an even greater extent dependant on the instincts and emotions". (3) McDougall expresses a similar view. Whilst agreeing that knowledge concerning an object favours sustained attention, he denies that such knowledge in itself is a condition of interest. According to (4) De Garmo interest has its primary root in inherited impulse, whilst (5) James refers to it as ' a natural sequel to the instincts' adding also that interest, once aroused in this way, can be carried over to other objects which would not in themselves arouse interest from instinctive sources.

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(1) Outlines of Educational Doctrine. J.F.Herbart. New York.

(2) Instinct, Intelligence and Character. G.H.Thomson.

(3) An Outline of Psychology. W.McDougall.

(4) Interest and Education. C.De Garmo. Macmillan N.Y.

(5) Talks to Teachers. W.James. Longmans, Green & Co..

" Some objects " he says, " are naturally interesting and in others/interest is artificially acquired ". There is then more general support for the conative aspect of interest than for the purely cognitive. ① Thomson makes this comparison " There are similar structures on the side of the feelings, also, corresponding to apperception masses on the cognitive side. These are the sentiments-----drawing their energy from the instincts---- The sentiment being " An organisation of emotions round an object or idea, while the apperception mass is an organisation of ideas and cognitive facts."

② "There are, we are told, certain interests and purposes common to all human beings as such. All share them, because as members of the same race , all inherit them." These inherited interests and purposes are similar in many respects to 'instincts' in the lower vertebrates. It seems. therefore, that all children start life with much the same equipment. Their early interests will have much in common, being based on this common inheritance. "③ Living things, then, moving things or things that savour of danger or of blood, that have a dramatic quality----these are the objects natively interesting to childhood". These inherited interests in turn lead the child into situations which engender further interests. "④ They continually prompt the child to enter into

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① Instinct, Intelligence & Character. G.H. Thomson.

② Relation of Attention to Instinct & Interest. C. Burt.
Report of LCC conference of Teachers. 1913.

③ Talks to Teachers. W. James. Longmans, Green & Co.

④ The Principles of Education. W. C. Ruediger.
George Harrap & Co. Ltd..

relationship with the things in his environment in active ways." The later development of interests will therefore be in such measure dependant on environment. The possibility that interests are the results of experience as well as inheritance must therefore be considered as well.

"An attitude (or interest) may be considered as a felt disposition arising from the integration of experience and innate tendencies". "When children are following up their own interests without outside interference they tend to indulge in make-believe. Adventure stories, radio serials and motion pictures may be quoted in this connection".. To a child"a toy becomes a means to enable him to realise himself in play, and as such is an object of interest". It follows, then, that later interest will be governed to a large extent by the child's surroundings, the opportunities offered to him to develop in one way or another, the attitude of his parents and, to some extent, the depth of his father's pocket. Fryer maintains in this connection that " The interest life of the individual is rich or bare according to his social background". The interpretation of 'rich or bare' may be ambiguous. Since each has only the same length of time to devote to interests, a wealthy boy may not necessarily have a

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(1) Attitudes--Their Nature & Development. L. Nelson. Journal of General Psychology 1939.

(2) Educational Psychology Gates, Jersild, McConnell, Challman. Page 207 Macmillan Co. N.Y.

(3) Interest & Education. C. De Garmo Macmillan. New York.

(4) The Measurements of Interests. D. Fryer. Henry Holt & Co. N.Y.

greater number of interests than one not so fortunate, but there are certainly grounds for thinking that the nature of the interest may be different in the two cases.

Another factor which may have some influence on the growth of interests is the maturity if the child. They must be governed in some measure by physical and mental capability. (1) "Interest involves acceptance-rejection". If early attempts to achieve some particular object fail through lack of muscular co-ordination, little or no interest is shown in that object until the physical development has reached the required standard. (2) Jersild quotes several examples in support of this and many others spring readily to mind from personal observations.

It is the common experience of every teacher that a child continually faced with work which he cannot successfully accomplish eventually becomes uninterested in that subject. His mental processes may not be sufficiently developed and the work has no meaning or value for him. (3) "Interest is a feeling of the worth to the self, of an end to be attained". A child of ten, with normal training and intelligence, could hardly be expected to enthuse over differential equations, whereas

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(1) Vocational Interests of Men & Women. E.K. Strong. Stanford Univ. Press.

(2) Child Psychology. A.T. Jersild. Staples Press Ltd..

(3) Interest & Education. C. De Garmo. Macmillan. N.Y.

the same child some eight or nine years later might quite conceivably derive great pleasure from them.

Interests, then, are not necessarily permanent, either in their presence or their absence. New interests may be acquired by change of environment, physical development and mental maturity. This is the view held by Thorndike, Fryer, Jersild, Strong and others. ① Tuttle writes " The possibility of increasing the strength of innate interests and of building up other interests has been established beyond reasonable doubt". Initially a child starts life with interests which are inherited and 'natural sequels to the instincts'. He has no knowledge which could stimulate interest or aversion at this stage. Later his muscular development widens his field of interests by increasing the number of tasks which he can successfully accomplish to his own satisfaction. A similar widening of interests takes place as his mental stature increases also. Alongside these processes comes the effect of environment, the opportunities which a child has for trying some particular line of action. All these changes cause extensions to the original innate interests so that ultimately we can agree with ② James that "An adult man's interests are almost everyone of them artificial.".

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① Emotion as Substitute Response. W. S. Tuttle. Journal of General Psychology. 1940.

② Talks to Teachers. W. James. Longmans, Green & Co..

Assuming then, that interests depend in some measure on achievement,(in order to produce a feeling of worth), and on ability,(to have the necessary physical and mental machinery to make some headway), we are faced with the problem of determining the relationship between them. We must see first how previous workers havetackled this or kindred problems.

SURVEY OF PREVIOUS RESEARCH.

Methods of Interest Testing.

The realisation that interest is an important psychological factor by which an individual may be guided into a better adjustment is comparatively recent. In the sphere of education [1] Fryer suggests its origin about seventy years ago. Early workers such as Comenius (1658) and Rousseau (1762) had held the view that education was a matter of personal satisfaction, but in general, from the time of the Greeks and Romans down to comparatively recent years, education was conducted for the benefit of the state, for society and its purposes. Attempts to measure interests seem to be even more recent. They may be divided into two categories, subjective tests of interests and objective tests of interests, each measuring a different type of interest. With the advent of measurement, human interests have lost some of the mystery with which education and industry had surrounded them. They are now defined by their measurement and named from the objects and activities which engage the attention of the individual.

Subjective interests are likes, which are estimated experiences characterised by feelings of pleasantness. The intensity of feeling is a measure of the degree of interest.

Objective interests are reactions, responses produced by some particular stimulus.

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[1] Measurement of Interests, D. Fryer. Page 14. Henry Holt & Co. N.Y.

(1) Woodworth defines interest from its subjective side as "similar to an emotion" and from its objective side as "a drive towards activity". From the dynamic point of view subjective interests might be regarded as feelings which are motivation stimuli to thought activity. From the same point of view objective interests might be regarded as driving stimuli initiating a series of reactions.

The methods by which subjective interests have been measured are largely those of estimating, viz,

Self estimates, voting, rating and ranking methods.

Estimates by teachers, parents and friends.

The validity of such estimates has always been open to serious doubts. They do not present a (2) genuine test situation. They may be rendered useless by 'halo' effects, or, in the case of estimates by other people, the reverse effects. The voting technique involves statistical difficulties since the absolute value of a persons voting standard may be different and the dispersion of votes may vary from one person to another.

In this connection (3) Kelley obtained teacher's ratings of 'emotional interest' in school work for 233 high school pupils and found that the average correlation between two teachers estimates of the same pupils was only .31. Similar

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(1) Dynamic Psychology. R.S.Woodworth. N.Y. Columbia Univ. Page 74.

(2) Assessment of Personality. C.Burt. Brit. Journal of Educ. Psychy, 1945. Vol XV. Pt. 111. Page 114.

(3) Contribution to Educ. No. 71, 1914. T.L.Kelley. Pages 14-18.

correlations for other traits, intellectual ability, conscientiousness, were no better. The intelligence of the testee may also have a marked effect on the value of the estimate. He may or may not be capable of analysing his own feelings sufficiently well to give a reliable estimate. If the situation warrants, for example if a consequence of the results of the test is known, the testee might easily present a deliberately false picture in order to achieve some desirable end.

There does not appear to have been any comparable work on the validity of self estimates of interest. ① Fryer treats the validity of ability estimates as an analogous problem, the results yielding an average correlation of .45 (mean) or .50 (median) when estimated ability was compared with the school grades received. ② Bridges and Dollinger obtained a similar value (.47) in the same type of investigation. This implies that these self estimates of ability are far from accurate although they have some measure of success. The inference that self estimates of interest will have the same order of validity is pure conjecture.

A further method of attempting to estimate subjective interests is the Interest Inventory in which an attempt is made to stimulate the individual to think about his interests. Miner's interest inventory, produced in 1913, gave

① Interest & Ability in Educational Guidance. J. Fryer. J. of Educ. Research, 1927.

② Correlation between Interests & Abilities in College Courses. J. W. Bridges & V. H. Dollinger. Psychol Review, 1920.

results which caused him to conclude that this method might afford some improvement in the validity of interest tests. ①

Inventory methods, too, are open to criticism. In the first place, there is the information error which arises when an individual attempts to assess his interest, or like, in some subject about which he knows relatively little. Since the inventory items are usually somewhat vague functions a person may often try to assess his interest in some function by what little he knows of a small aspect of it. One is apt to over-generalise from limited experiences. Again the question of an individual's ability to truthfully analyse his own interests enters into the criticism of this type of test.

Objective measures of interest have been attempted by the following kinds of tests:-

Information tests, including vocabulary tests.

Free Association Test.

Word Association Learning Test.

Distraction Materials Test.

Educational theory implies that knowledge and interests go hand in hand. If one is interested he will acquire information, if he is not interested the amount

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①An Aid to the Analysis of Vocational Interests. J.B.Miner. Journal of Educational Research. 1922.

of knowledge will be less. Unfortunately for the Information test, interest is not the sole factor determining information. Ability plays a large part, as does also experience in the particular field. Using an information test (1) Burtt reported a higher correlation with estimates of ability than with estimates of interest. Of the same type of test (2) Toops says "we are attempting to measure the attainment side of interests as opposed to the emotional side of interests".

The Free Association test can take either of two forms, the continuous and the discrete. In the former the person tested is required to start with a key word and then to write, or say, as many words as possible that come to mind before he is told to stop. The second form, the discrete test, requires that the person shall write, or say, the first word that comes to mind on hearing the key word. Both forms of the test can be scored for frequency of reactions in definite fields of activity, and as such indicate development of interest. (3) Wyman carried out an investigation with the discrete form of the Free Associations method as a measure of verbal interest reactions. It seems to hold much promise forthe measurements of interests, out

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(1) Employment Psychology. H.E. Burtt. Boston 1926.

(2) Test for Vocational Guidance of Children, Thirteen to Sixteen. H.A. Toops. Contributions to Education. Columbia University No. 136, 1923.

(3) The Measurement of Interest. J.B. Wyman. Vocational Guidance Magazine 1929. Pages 54-60.

is limited in its application by the work needed to develope scoring keys. The ability factor can be eliminated and an objective measurement of interest made.

On the assumption that students interested in agricultural engineering would more readily associate pairs of words related to that vocation because of the pleasant feelings aroused in those associations Burtt devised a Word Association Learning Test as a measure of interest. The measure of interest is a comparison of learning, or memory, for specialised material with learning, or memory for general material. Pairs of words were read out so that they might be associated together. After this, the first word of a pair was repeated, and the individual asked to give the word associated with it. The score is the ratio of the number of specialised associations to the number of general associations, thus eliminating the influence of intelligence. From correlations with instructors estimates of interest and ability, Burtt was forced to conclude that the test was one of ability to learn rather that one of interest.

Reasoning that a person is less likely to be distracted when he is interested, Burtt devised a distraction test of interest. Two prose passages, one of standard or normal stimulus and the other of specialised interest stimulus were presented to the person under test. Each passage contained a large number of irrelevant words and the

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(1) Vocational Tests for Agricultural Engineers. H.E. Burtt & F. Ives. Journal of Applied Psychology. 1923, V11.

instructions were to cross out the irrelevant words as fast as possible without mistakes. The score was given by the ratio of the number of words crossed out in the normal stimulus to the number crossed out in the interest stimulus. The chief criticism of this method is that it is chiefly a test of motivation, or drive in the special field, rather than of interest, or pleasant feeling in this field. The measure of interest given by this method correlated .23 with instructors estimates, a markedly better value than that given by the Learning test. Perhaps the chief value of Burtt's work lay in his showing how to eliminate the ability factor from tests of interest.

An account of methods of interest testing would not be complete without mention of a recent technique due to Peel[1], enforcing a choice between items which fall into two different interest groups. Initially the technique was applied to an information test of the multiple choice type. The test was divided into sub-tests each containing six items, three of them practical, and three academic. In any one sub-test the six items were of equal difficulty as measured by a previous validation test using a sample of children similar to those for whom the final test was intended. The items thus selected were mixed in random order and the children instructed to answer three items only from each sub-test of six. In this way it was thought

[1] Assessment of Interest in Practical Topics. E.A.Peel. British Journal of Educational Psychology. Vol.XVIII Pt. 1 February 1948, Pages 41-47.

that an interest or preference for practical topics on the one hand or academic topics on the other would manifes itselfin a preponderance of answers in one group compared with the other. The ability factor was cancelled out by interpreting the interest score as $\frac{P-A}{P+A}.100$ where P was the score of practical items and A the score of academic items. Positive interest scores indicated mainly practical interest and nagative scores mainly academic interest.

Unfortunately it was found that there was a tendency for some children to answer the earlier questions in the easier sub-tests irrespective of their interest group. Presumably being in some natural haste under examination conditions, they were not taking sufficient time to view the six questions of the sub-test as a whole before making a choice.

To counter this defect the polarity technique was next applied to a 'meaning of words' tests of the type used by Slater[1] in his Selected Vocabulary Test. Peel's modification of this test used wordsselected to show 'practical' and 'academic' interests. Each sub-test consisted of three 'practical' words and three 'academic' words. Against three only the meaning had to be written or a drawing made. This reduced the mass of material to be perused from a full quarto sheet of type down to six words thereby aiding rapid comprehension of

[1] Selective Vocabulary Tests. Handbook & Tests. P. Slater. Harrops London. 1944.

the items and increasing the likelihood of a valid assessment of interest. Marking became more difficult but a marking key of correct and incorrect responses was compiled. The details of scoring were the same as those for the information test. Two points in favour of this type of test are

1. It sets up a marked polarity between two groups of interests, and
2. It does provide a genuine test situation since the object of the test is not known to those taking it.

In common with other interest tests it leaves open to question whether or not it can differentiate between permanent, or fixed, interests and fleeting fancies.

RESULTS OF PREVIOUS RESEARCH.

Previous work in the field of interest measurement may be divided into two main classes,

1. that by people concerned with vocational guidance and 2. that by those working in the educational sphere. Since the present work is very definitely confined to schoolboys this review of earlier work will be largely restricted to that which dealt with school and college situations, with an occasional reference to vocational interests where there seems to be some relationship in either content or method.

In 1913 (1) Kelley used an interest questionnaire, scored for group interest, with high school pupils. This seems to have been a pioneer work in this field but it had apparently little effect on the work of later investigators into group interests, since no further mention of it appears until 1930, at a time when standardisation of interest inventories had been proceeding for some years. Kelley's battery of questions used both inventory and testing methods, involving ranking and self estimates on the one hand with vocabulary and information testing on the other. The scoring keys were based on judges' estimates, the correlations between these varying widely according to the group of interests concerned. It is also interesting to learn that regression equation technique was first

(1) Contribution to Education. No. 71, 1914. T. L. Kelley. Pages 40-62.

applied here in interest measurement. Scores in the various sections of the inventory were weighted to give an estimate of total interest score in any group.

Thorndike[1][2] asked first 100 and later 344 college students to rank seven general educational subjects in the order of their interest,

a) at the elementary school stage,

b) at the high school stage,

and c) as they interested them in college.

The students were asked further to rank these subjects according to their abilities in them. The correlation between each individual's ranking of interest and ranking of ability was then evaluated, with the following results:-

Educational period	Average (Median) Correlation for 100 students	344 students
Elementary school	.89	.89
High school	.89	.89
College	.89	.89

Using the results of Bridges and Dollinger[3] for a similar study, Thorndike[4] found a correlation of .46 between

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(1) Permanence of Interests & then Relation to Abilities. Popular Science Monthly, 1912. E.L. Thorndike.

(2) Early Interests, Their Permanence & Relation to Abilities. School & Society, 1917. E.L. Thorndike.

(3) The Correlation between Interests & Abilities in College Courses. Psychological Review, J.W. Bridges & V.H. Dollinger. 1920.

(4) The Correlation between Interests & Abilities in College Courses. Psychological Review, 1921. E.L. Thorndike.

an individual's courses ~~[for interest and the courses]~~ ranked for interest and the courses ranked according to college grades received. For the same study an average correlation of .70 was found between rank in interests and rank in estimated abilities.

From this Thorndike contended that interests are highly predictive of abilities. In view of the small number of subjects involved (seven), and the fact that both interest and ability estimates were made at the same time, there is good reason to believe, or suspect, that students would be guided, or at any rate affected in some degree, by the memory of their first list when compiling the second. On these grounds alone, apart from the general weaknesses of estimates, the correlations might be deemed optimistically high. The figure of .46 between interests and grades has perhaps more to recommend it. Thorndike preferred the argument that chance errors in college grades rendered .46 lower than the true figures.

Repitition of Thorndike's experiment by Fryer①, giving very similar results, viz:-

Educ. Periods	No.	Interest & Estimated Abilities.	No.	Interest & School Grades.	Interest & Estimated Abilities.
Elementary	63	.85 ± .02	24	.63 ± .09	.85 ± .02
High Sch.	68	.86 .02	28	.60 .08	.89 .03
College	45	.89 .02	14	.80 .07	.82 .07

① Interest & Ability in Educational Guidance. D. Fryer. Journal of Educational Research. 1927.

To counter the effect of interest and ability estimates being made at the same time, (1) King and Adelstein again used Thorndike's method but with this condition changed. They again found a high correlation:-

Elementary School	.73
High School	.79
College	.73

The procedure of limiting and determining the school subjects to be ranked may have increased the correlation as might also the fact that Thorndike's subjects, which were representative of the elementary school curriculum, were not as truly representative of high school and college curricula. (2) Fryer made a further study of the subject, attempting to control the factors influencing the measures of relationships just described. This time no limitation, other than of number of choices, was imposed. Expressions of interest and estimated abilities were taken at three day intervals, for example estimates of interests and abilities at the elementary school stage, followed three days later by estimates of interests and abilities at the high school stage, and, after three further days, the estimates for the college stage.

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(1) The Permanence of Interests & the Relation to Abilities. School & Society, 1917. I. King & L. Adelstein.

(2) Interest & Ability in Educational Guidance. D. Fryer. Journal of Educational Research, 1927.

Educ. Periods	No.	Interest & Estimated Ability.	No.	Interest & School Grades.	Interest & Estimated Ability.
Elementary	104	.57 ± .04	47	.10 ± .09	.57 ± .06
High Sch.	104	.70 .03	50	.33 .09	.70 .06
College	43	.60 .07	30	28 .11	.66 .06

Later all assignments were separated and requested at intervals of several days, the results being materially the same as before. In general, correlations between .60 and .70 seemed to represent the relationship between interests and estimated abilities , and correlations between .30 and .40 appeared to represent the relationship between interests and ability as given by school grades.

A different approach to the problem was made by Columba, who compared the educational achievement of school children who prefer a certain school subject to that of the remainder of the class. Using the Stanford Achievement Test for both groups:-

Grades.	Average Achievement Quotients. Group preferring subject.	Remainder of class.
V	111.8	112.4
V1	104.4	100.8
V11	101.0	101.2
V111	101.1	96.7
All grades	104.2	102.8

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① A Study of Interests & Their Relations to Other Factors of Achievement in the Elementary School Subjects.

M. Columba. Cath. University of America. Educ. Research Bul. 1926.

The results reveal a slight but hardly significant tendency for those interested in a subject to do better than those not so interested.

In a study based on 527 normal children and 643 gifted children, (those with IQ 140 or above), (1) Terman found the following correlations between educational interests and abilities.

Gifted boys	.44	Gifted girls	.18
Normal boys	.48	Normal girls	.55

In this case the educational interests were estimated by the children and the educational abilities were estimated by the teachers. These correlations are somewhat lower than those previously quoted.

Summarising these tests of interest by estimates and ranking and of achievement, (2) Fryer concludes that self-estimated educational interests are not in any high degree indicative of educational ability, but can only be said to be suggestive of such ability. Such a statement of interests can hardly be used with confidence in predicting ability.

At about the same time the interest inventory was also used to attempt to predict educational and vocational abilities from expressions of interest. In an attempt to distinguish between successful and unsuccessful college

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(1) Mental & Physical Traits of a Thousand Gifted Children. L. M. Terman. Vol. 1 of Genetic Studies of Genius. Stanford University Press, 1925.

(2) Measurements of Interests. D. Fryer. Page 233. Henry Holt & Co. New York.

students, [1] Kornhauser (1923) administered his General Interest Inventory to 110 freshman in the University of Chicago, taking college grades as the criterion of educational ability. The group was divided into 25% with the highest grades, 25% withthe lowest grades, and the remaining 50% intermediate. To produce a scoring key, 15 students were taken from each group.

The results showed an overall correlation of .52, but it was found that the group used for producing the scoring keys showed a correlation of .73, whereas the correlation for the remainder was only .17, suggesting little relationship between interests and achievement (as shown by grades)

Kornhauser also investigated the prediction of academic success by extreme interest scores using a five degree classification ranging from intense like to intense dislike. Separate groups of students gave contradictory results with this test, correlations from -.22 to a similar but positive value being obtained for the relationship between extreme interests and college grades.

Similar attempts to predict college achievement from interests was also made by [2] Shuttleworth (1924-1926), using an inventory of 200 general interest items. Dividing

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[1] Results from a Quantitative Questionnaire on Likes & Dislikes used with a group of College Freshmen. A.W.Kornhauser. Jour. of App. Psych. 1927.

[2] Measurement of the Character & Environmental Factors involved in Scholastic Success. F.K.Shuttleworth. Univ. of Iowa. Studies in Character. 1927.

his sample of 269 women and 374 men into groups of superior, average, and inferior intelligence for the one part and into groups of superior, average and inferior scholarship for the other, he found 34 items to differentiate between the superior and inferior groups for intelligence, and 60 items to differentiate for scholarship. These items formed his two scoring keys. The correlations between interests and intelligence, and interests and scholarship were :-

Interests	(Scholarship key)	v	Scholarship	.50 ± .05
"	(Intelligence key)	v	"	.18 .06
"	(" ")	v	Intelligence	.40 .05
"	(Scholarship key)	v	"	.49 .05
"	(Combined keys)	v	Scholarship	.42 .05
"	(" ")	v	Intelligence	.54 .04

These results include the group upon which the scoring keys were devised, the effect of which has been mentioned earlier.

The Minnesota Experiment carried out by Paterson[1] and his co-workers was a further attempt to score an interest inventory for prediction of educational ability or scholarship. The criterion in this case were the College Ability test as a measure of intelligence, and scholastic grades as a measure of achievement.

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[1] The Quantitative Determination of Scholastic Interests among College Students. M.M.Jacobsen. Unpub. PhD. dissertation. Univ. of Minnesota. 1928.

The results of this work were similar to previous values and did not encourage selection of college students by means of their interests. The suggestion was made, however, that interest differences between ability groups were constsnt enough to use interests to differentiate between these groups. In producing a new scoring key for further study, the intelligence factor was held constant, that is, the primary group used to produce the key consisted of:

196 men and 233 women superior in educational ability (and superior in intelligence)

313 men and 139 women inferior in educational ability (and superior in intelligence)

The results were as follows:-

	Men		Women	
	Men's key	Common key	Women's key	Common key
Interest v Intelligence	.21	.33	.40	.33
" v "(Ed.Ab.Con)	.08	.19	.22	.16
Int. & Ed. Ability.	.30	.35	.44	.39
" v " (Intell. Con)	.23	.23	.29	.26
Int. v Ed. Ability.	.48	.48	.54	.54
" v "(Int. Con)	.45	.40	.44	.47
Int. + Intell. v Ed. Ability	.58	.55	.63..	.65

Using the evidence of the last row of figures the third Minnesota Scoring key of Educational Abilities was made part of the procedure for the selection of students at Minnesota.

Hubbard's " Interest Analysis blank" for boys was based largely on the revised form of the Minnesota test. Other inventory tests of interest were used about the same

time by Cowdery at Stanford University, Freyd, Brainard and Remmers, Strong's " Vocational Interest Blank " was largely the outcome of Cowdery's inventory; although Strong's test contained many modifications and additions, including the new instruction to 'work rapidly'.

For use at High School level the 'Preference Questionnaire' was developed by Garreston[1], and administered to 483 freshman boys at a high school of commerce, 503 freshman boys at an academic high school, and 596 freshman boys at a technical high school, all in New York City. To get rid of the influence of ability differences and to use a definite educational interest criterion for the selection of groups, Garreston chose for his primary (scoring) group 151 commercial students, 157 academic and 152 technical students, selected at random from those whose academic grades were above the avarage for their class (in typing and book-keeping for the commercial school, in English, foreign language and civics for the academic school, and in shop and mechanical drawing for the technical school). Three scoring keys were thus evolved for commercial, academic and technical educational interests.

	Commercial key	Academic key	Technical key
	Mean	Mean	Mean
Commercial H.S.	+48.8	-24.0	-33.6
Academic H.S.	-1.2	+18.6	-12.7
Technical H.S.	-47.4	-81.0	+140.2

[1] Relationships between Expressed Preferences and Curriculum Abilities of Ninth Grade Boys. O.K.Garretson. T.C.Columbia Univ. Cont. to Educ. No. 396, 1930.

Marked interest differences are thus obtained between the three schools, the technical school interests being most widely different from the others. The results of the investigation could also be set out to show the correlation between interest scores and inclusion or non- inclusion in the group for which the inventory was scored:-

Comm. Int. Scores	v.	inc. or non-inc. in Comm. Int.	.73 ± .0
Academic	v.	acad.	.56 ± .05
Tech	v.	tech.	.87 ± .03

This provided substantial evidence for the existence of group interests at the high school stage.

①Strong, reporting results obtained with his Vocational Interest Blank, gave correlations for interest scores with intelligence for people engaged in various types of employment, the figures having been obtained at various stages in their educational development through high school and college. He concluded that "occupational interest scales measure traits which are not primarily associated with intelligence", 80% of the correlations lay between .30 and -.30, 97% between .40 and -.40, the largest coefficient being .45. In general terms the results suggested that men of high intelligence were more likely to possess the interests of scientists, accountants, lawyers and writers, and less likely to have the interests of those dealing with office procedures, and with selling to, or serving people. Even so, the differences were too small to be of value in predicting individual cases.

① Vocational Interests of Men and Women. E. K. Strong. Stanford Univ. Press, 1943. Page 332.

In an attempt to find the relationship between breadth of interest and intelligence, Strong[1] used his blank to find the number of items liked or disliked in any group, and compared this with intelligence and with scholarship as denoted by grades.

	Intelligence		Scholarship	
Class of item	No. of likes	No. of likes minus dislikes	No. of likes	No. of likes minus dislikes
Occupations	-.03	-.01	-.14	-.10
School subjects	-.06	-.05	-.05	-.04
Amusements	-.12	-.11	-.14	-.12
Activities	-.11	-.15	-.12	-.19
Kinds of people	.05	.03	-.03	.00
Average	-.05	-.05	-.10	-.09

The figures failed to support the assumption that intelligence would be associated with breadth of interest, and offered no greater justification for the view that scholarship often results from lack of interest in social affairs.

Such, then, were the major researches in the educational field up to about 1940, using subjective tests to provide a measure of interests in educational or vocational topics. Play and activity interests will be dealt with later in this survey. The results generally imply that, whilst there does exist some relationship between educational interests, intelligence and achievement, the degree of correlation is not large enough to merit using interest scores to predict success in any particular direction.

[1] Vocational Interests of Men & Women. E. K. Strong. Page 336 Stanford Univ. Press 1943.

Alongside the subjective tests of interest other workers were experimenting with objective tests, perhaps the earliest study being that of Wissler,[1] in 1895, who used an information test to measure things that children remembered from their earlier readings, the amount remembered being taken as a measure of reading interest.

The ' Range of Interest ' test by Robinson[2] in 1916, a test of the ' true-false ' variety, was designed as a measure of general interests and administered to salesmen, minor executives, business officials and high school and college students. The test revealed considerable differences between groups, but whether these were differences of interest or of ability is difficult to judge.

Groups	Percentile Scores 0	20th.	50th.	80th.	100th.
High SChool Freshmen	?	15.5	33.5	47.5	77
" " Seniors	?	41.5	54.5	66.5	78
College Freshmen	?	52.5	65.5	77.5	90
Salesmen	10	52.5	69.5	83.5	100
Minor Executives	28	57.5	76.5	89.5	100
Higher Officials	40	70.5	84.5	94.5	100

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[1] Interests of Children in the Reading Work of the Elementary Schools. C. Wissler. Ped. Sem 1898

[2] Aids in Selecting Salesmen. Bulletin No.5 Bureau of Salesmanship Research Carnegie Institute of Technology 1918

Information tests designed to investigate Mechanical Interests have been based largely on an original which, according to O'Rourke, was devised by Rice prior to 1920. A set of 60 pictures of tools and mechanical objects in general formed the basis for this information test of the recognition variety. The questions dealt with selecting the correct tools for various jobs. Much of the early use of this form of test was in the United States Army camps for purposes of trade selection but later Toops[1] developed a General Trade Interest Test for Girls and O'Rourke produced his 'Mechanical Aptitude Test', composed of a Mechanical Interest Test and a General Trade Interest Test. Recognition questions and multiple choice items made up Parts I and II respectively of the test.

On the assumption that a man who has a fund of social information prefers to associate with people Ream[2] constructed an information test of the multiple choice type, his 'Social Relations Test', to show range and type of social interests. The items of the test were in three groups, socially acceptable, sports, and socially questionable, the last group being said by Burtt[3] to be a potential source of dishonesty. Burtt[4] himself

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(1) Tests for Vocational Guidance of Children 13 to 16. H.A. Toops T.C. Columbia University, Cont. to Education, No 136, 1923.

(2) A Social Relations Test M.J. Ream
Journal of Applied Psychology, 1922. VI

(3) Employment Psychology, H.E. Burtt
Boston , 1926

(4) Vocational Tests for Agricultural Engineers, H.E. Burtt and F.W. Ives
Journal of Applied Psychology, 1923 VII

devised a similar type of test sampling the interests of agricultural engineers, while McHale[1] experimented with an information test, multiple choice type, as a measure of the vocational interests of college women.

A summary of many of the information tests of interests in comparison with various criteria is given below

Criterion	Correlation	Research Worker
Estimates of Interest	.10	Burtt
	.15	McHale
Estimates of Ability	.24	O'Rourke
Achievement and success	.28	Burtt
	.30	O'Rourke
	.31	O'Rourke
	.73	McHale
School Grades	.16	O'Rourke and Toops
	.32	
	.33	
	.41	

The low correlation with estimates of interest is outstanding although, in view of the doubtful reliability of estimates, not entirely damning. The correlation with achievement is also low. The suggestion seems to be that, on the whole, such information tests measure interest to a slight degree and that the relationship with achievement is that to be expected in all interest measurement. One suspects that McHale's test measured something other than interest

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[1] An Information Test of Interests K. McHale

The results of information tests of interest have also been related to abstract ability, or intelligence, scores. Ream, McHale, O'Rourke and Toops , amongst others, have investigated this relationship.

Ream produced the following correlations between his Social Relations Test and Intelligence

Socially acceptable items	.71
Sports	.53
Questionable items	.38

McHale on the other hand, in five fields of vocational activity, found much lower figures:-

Educational and Social Science	-.08
Homemaking	.19
Business	.30
Science	.10
Law	.28

Toops and O'Rourke made comparisons of Mechanical Interest measures with abilities in the same field using the Army Mechanical Interest Test and Stenquist's Test for mechanical ability.

Ability Test	Group	Correlation
Stenquist Assembling Test, Series 1	Elementary Schoolboys	.41 ± .05
	Secondary "	.24 ± .05
Stenquist Picture Test 1	Elementary Schoolboys	.44 ± .05
	Secondary "	.50 ± .04
Stenquist Picture Test II	Elementary Schoolboys	.46 ± .04
	Secondary "	.50 ± .04

Substituting the Army General Trade Interest Test these figures were all reduced by about 30%.

Test for Vocational Guidance of Children, 13 to 16. H.A.Toops. T.C. Columbia University. Cont. to Education, No. 136, 1923

There was therefore a significant change in correlation according to the type of interest test used. Since there was a great similarity between the mechanical interest test and Stenquists picture tests it was not unlikely that they tended to measure the same thing, be it either interest or ability. The correlation with the assembling test then became the most important. (1) Fryer concluded that " when the measures are in the same field of human reactions ability tests and interest tests of the information variety measure the same thing to a substantial degree."

The outstanding example of the Free Association Test of Interests is that due to (2)(3) Wyman, limiting the study to children and dealing with three specific fields of interest reaction, viz intellectual, social and activity. Using a list of 120 stimulus words, balanced for equal response, the 'discrete' form of free association test was administered to pupils between 10 and 14 years of age. An attempt was first made to find differences of interests between normal and gifted pupils (those with I.Q. above 140), the differences found being relatively small.

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(1) Measurement of Interests. D.Fryer. Page 285

(2) Genetic Studies of Genius, Vol.II . L.M.Terman. Pages 455-483
Stanford University Press 1925

(3) The Measurement of Interest. J.B.Wyman
Vocational Guidance Magazine, 1929 , VIII

For correlation with intelligence, measured by the National Intelligence Test, and achievement, measured by the Stanford Achievement Test, Wyman found the following:-

Interest	N.I.T.	Stanford	Stanford(N.I.T.constant)
Intellectual	.46	.63	.49
Social	.50	.50	.18
Activity	.47	.38	.03

Wyman concluded that " we find that the most successful child is highly intelligent and highly interested. Some childrem who are not highly interested have succeeded, but but they are highly intelligent. Again some highly intelligent, but not highly interested, have not succeeded and, finally, some with lower intelligence and not a high degree of success are highly interested. The answer ..... then is that a child must be interested to achieve success, the greater the interest and the higher the intelligence, the greater the success ..... and not that ability to succeed produces the interest.

Of the tests by Burtt mentioned earlier little more need be said, bringing us to the recent development by Peel (1) who has given his practical interest tests to boys of 11+ years of age from the top 30% of the ability range as determined by Moray House tests in Intelligence, English and Arithmetic. Practical interest measured by these tests has also been correlated with practical ability tests and with a Moray House intelligence test, giving these figures :-

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(1) Assessment of interest in Practical Topics. E.A.Peel
British Journal of Educational Psychology. Feb. 1928
Vol. XVIII

Alexander's Performance Scale	.249
Peel's Practical Test	.233
Moray House Intelligence	-.261

The polarity in interest seems therefore to correspond with some real difference in practical and verbal ability.

Research into the reliability of such tests, comparison with questionnaire methods and judgement of their validity has been undertaken by Angus.① Using Peel's form of Information Test and Vocabulary Test together with a questionnaire and teacher's estimates of interest Angus found the following correlations taking the teachers' estimates as a criterion.

Information Test	.803
Vocabulary Test	.647
Questionnaire	.387

Employing Thurstone Analysis he found further that the Vocabulary test contained the least scientific ability factor and was, in this respect, the best measure of interest. By the same analysis the questionnaire was found to be the poorest measure of interest. He concluded that scientific achievement depends more on intelligence than on interest but that interest combined with intelligence gives a better prediction of achievement than either used separately.

Since this present work is to deal with leisure time interests it is necessary to mention the previous work done in assessing play interests in addition to the foregoing account of educational and vocational interests.

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①Comparative study of the methods of interest measurement in Science and its relation to Ability and Achievement. L. Angus. M.Ed. Thesis. Durham University 1949

Methods used in the study of play interests have been

a) the questionnaire
b) lists of activities for checking games liked or played
c) results of personal observation by investigators
d) assembling the opinions of play experts
e) survey of recreational facilities
f) information tests

As we are dealing with boys about the age of 14 years the mass of work done with children at the nursery stage will be left untouched. The majority of the work in this field seems to have aimed at arranging games and other play interests in order of preference. (1) Jersild quotes figures from studies of this type, showing changes of interest with maturity. (2) Strong gives similar results. Radio interests, motion pictures and comics have been treated in similar fashion. (3) Lehman's 'Play Quiz' aimed principally at securing norms of play adjustment for various ages.

(4) Terman seems to have been the only investigator to attempt to correlate play interests with intelligence. In his comparative study of normal and gifted children he found that, in general, the gifted children scored more highly than the normal children in intellectual interests and in social interests. The activity interests of the two groups

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(1) Child Psychology. A.T.Jersild Pages 486-489 Staples Press.

(2) Vocational Interests of Men and Women. E.K.Strong. Page 248

(3) The Psychology of Play Activities. H.C.Lehman & P.A.Witty New York, 1927

(4) Genetic Studies of Genius, Vol I. L.M.Terman. Stanford Univ. Press, 1925

were about the same. His findings for the comparison of play interests were as follows:-

Groups	Correlation Coefficient
Gifted boys and Normal boys	.83
" " " Gifted girls	.20
" " " Normal girls	.18
Normal boys and Normal girls	.35
" " " Gifted girls	.22
Normal girls and Gifted girls	.82

The inference is that play interests seem to be determined by sex rather than by intelligence, there being little evidence here that play interests and intelligence are closely related in children.

From the foregoing survey it will be seen that, whilst a considerable amount of work has been done to establish the correlation of educational interests with achievement (and ability) and vocational interests with achievement and ability), relatively little has been done in the field of leisure time interests. An approach was made by Kornhauser, Shuttleworth and Paterson, all of whom tried to relate general interest with achievement, working with college students in various American universities and using inventory methods. Similar ground was covered by Strong.

Terman compared the play interests of normal and gifted children but does not appear to have correlated the interest measurements with intelligence or achievement. Perhaps the closest approximation to the present work was that of Wyman, although the technique employed was entirely different and her work, like that of Terman, was carried out in America.

There appears therefore to be a sufficiently good case in favour of trying to assess the leisure time interests of schoolboys in this country and attempting to correlate these interests with ability and achievement.

STATEMENT OF THE PROBLEM

AND

TENTATIVE HYPOTHESIS.

Statement of the Problem

We have seen, then, the general outline of this enquiry and its relation to previous work in interest testing. It becomes necessary now to state more clearly and precisely our objectives before going on to discuss means of attaining them.

It must be stated that leisure time interests will be treated under three main headings, following the general lines of Terman and Wyman. The first group will be termed ' intellectual ' interests, pastimes involving the exercise of mental faculties but not requiring physical action as a principal component. In the second group, the ' active ' interests, will come amusements involving considerable mental application but requiring also manual dexterity or physical energy in a large degree. Finally the ' passive ' group of interests, amusements where the pleasure derived depends to a great extent on someone else's performance and little or no effort, mental or physical, is needed from the boy himself. An attempt will be made to obtain a measurement of each of these three types of interest among boys about 14 years of age, some of them in Grammar Schools and some in a Secondary Modern School. The first part of the investigation will be to see if any marked difference exists between the interest measurements of grammar school boys and those of boys from a secondary modern school.

The enquiry will then be taken further. Measures of

general ability and of practical ability will be obtained for all boys, together with measurements of achievement where possible. The achievement measures will be in school subjects, taking as wide a variety as possible. Correlations will then be obtained between the various interests and the abilities and achievements just mentioned. The problem then may be summarised as follows :-

to obtain measurements of various types of leisure time interests among boys at about 14 years of age, leading to

a) a comparative study of such interests among grammar and secondary modern school pupils, and to

b) an attempt to correlate these interests with specific abilities and achievements.

The Tentative Hypothesis

We have seen earlier that the psychologists regard interests as arising primarily from instincts, their later growth being governed largely, on the one hand, by environment and social background, and on the other by maturity, particularly concerning physical and mental development. From this it might be expected that ability in some particular direction might be accompanied by a high measure of interest in that direction. At the same time the majority of experimental evidence, whilst giving a positive correlation between these two quantities, does not support the idea of a high correlation. In our case we are not even dealing with interests, abilities and achievements which lie in the same direction. The abilities and achievements are those in educational fields whilst the interests are those followed out of school. Under these circumstances it does not appear reasonable to expect high correlations between the various leisure interests and ability or achievement.

At the same time it is not outside the bounds of possibility that, say, the intellectual group of interests will be found to correspond with higher ability and achievement than does the passive group. The growth of interest is helped by a measure of success, and success in the pastimes of the intellectual group is dependent on the possession of the power to think clearly. The passive interests however need no such faculty of reasoning for their gratification. It

does not necessarily follow, however, that somebody with a high I.Q. will have a preference for intellectual pastimes compared with the passive group, but at any rate they have the mental equipment required for the development of such a preference. The inference seems to be that those with low I.Q.'s might be expected to reveal a greater measure of interest in the passive group since they will, generally speaking, lack the mental powers necessary to obtain satisfaction from success in intellectual pastimes.

A similar argument may be applied to the case of active interests and practical ability.

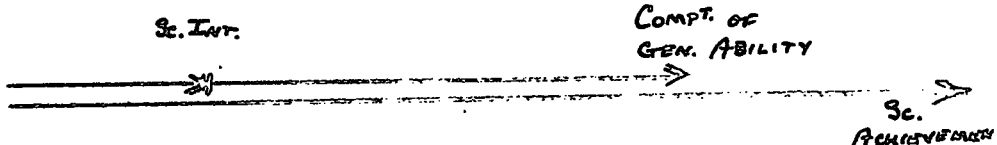
Our hypothesis is then that intellectual interests are dependent on the possession of general ability and that, similarly, active and practical interests are dependent on the possession of general plus practical ability. Lack of ability results in a preponderance of passive interests.

We are lead to expect a positive, though probably small, correlation between intellectual interests and abstract ability, a smaller or even a negative correlation between passive interests and ability, and the active interests somewhere between these two extremes. Correlating with practical ability we might anticipate a positive value with active interests, a smaller or even a negative value with passive interests, and an intermediate value with the intellectual interests.

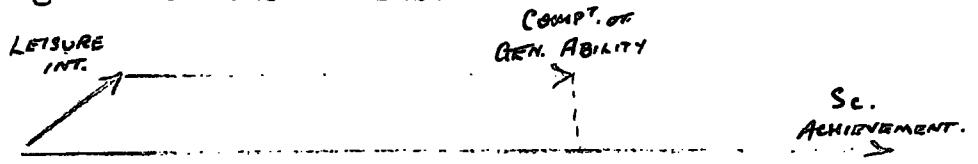
In our comparison between the interests of grammar and modern school pupils it might be expected that the grammar school boys will show a higher measure of intellectual interests and a smaller measure of passive interests. The case of the active interests is somewhat ambiguous, but general ability will probably cause grammar school boys to show more evidence of these interests than do the modern school pupils.

Many analogies have been made relating interest, ability and achievement to each other. Ability has been likened to the driving power of a ship with interest as the rudder, the progress made under these two influences being the achievement in any particular direction. In our case the comparison is not quite so straightforward. The interests are not directed in the same line as the achievements.

Another simple illustration can be given by means of vectors, considering the case of general ability, scientific interest and scientific achievement. Taking the scientific achievement as our base line we can represent scientific interest by a vector parallel to this line. General ability can be regarded as having a component in the direction of scientific pursuits so that the achievement vector can be visualised as the resultant of the interest vector and the component of the general ability vector. i.e.



When the interest and achievement are not in the same direction a slight difference arises.



Interest plus ability can be expected to produce achievement in some direction and this resultant will have a component in the direction of scientific achievement. Thus whilst we may expect some positive correlation between leisure interests and achievement in kindred groups of school subjects we can hardly expect a high correlation between them. Similarly achievement in any subject may be found to depend on both leisure interest and general ability, but probably to a smaller degree than it depends on interest in that subject plus general ability.

Let us then summarise the anticipated results, indicating the possible direction and extent of the correlations, presupposing the use of interest tests of Peel's vocabulary type.

Intellectual versus Active Interests

1. Small but positive correlations with I.Q.s and with general ability, and to a still lesser extent with practical ability.

2. Similar small but positive correlations with achievement in academic subjects, e.g. French, Geography. Small but negative correlation with success in Physics, a more practical subject. The relationship with Art is unpredictable.

Intellectual versus Passive Interests

1. Positive correlations with ability tests of all types.

2. Positive correlations with all subjects, with the possible exception of Art.

Active versus Passive Interests

1. Positive correlations with ability tests, the largest value being with practical ability.

2. Positive correlations with all subjects, again with the possible exception of Art, where the nature of the test can vary widely and so alter the qualities tested.

EXPERIMENTAL PROCEDURE.

Selection of Tests

Our objectives being mow defined the next point for discussion was how to attain them. We required measurements of ability, achievement and interest. The first two were the most easily obtained and for this reason we dealt with them first.

To obtain the intelligence quotients of the boys the Otis Gamma test, Form A , was selected. Although this test was intended for pupils from 15 to 18 years of age norms had been found for pupils down to 11 years of age and so the test was suited to our purpose. It had been found also to have a high validity as a mental ability test.

The raw scores of the Otis test would have served as a measure of general ability but it was decided to use as an ability measure a test prepared by Professor Peel which had not been graded for ages, This test is referred to throughout as the Ability Test.

Another test devised by Professor Peel, the V.S.10, was chosen to give a measure of practical ability, as distinct from general ability. This was a non-verbal test of the 'error in pattern' form which had been successfully used elsewhere to differentiate between practical and academic abilities.

In one grammar school examinations in all subjects were held in the same week that the tests were given. These

examination results therefore seemed to be a ready-made means of testing achievement in school subjects,

A difficulty arose however in the fact that both streams in the form concerned did not always take the same examination paper in all the subjects covered. It was found that only in four subjects, French, Geography, Physics and Art were they examined and marked in the same way. Fortunately these subjects provided a fair cross-section of those studied in the school. French- a literary subject, Physics - a science, with Geography a mixture of literary and scientific work. Art, in this case a painting from memory, stood out by itself.

The choice of a suitable form of interest test presented rather more difficulties. The ideal way of ascertaining a boy's interests would seem to be by personal observation throughout the whole of his working hours. Since it was proposed to work with some two hundred boys nothing less than a small army of investigators, each combining the qualities of H.G.Wells' Invisible Man with those of Dr. Susan Isaacs, would have been sufficient. The use of some form of pencil and paper test therefore seemed the most feasible solution.

The various forms of such tests, with their attendant weaknesses, have already been mentioned. Questionnaires, inventories, voting, rating and ranking methods were riddled with possibilities of error. Information tests were more

likely to test achievement than interest. Free association and distraction methods required many more pupils and much more time available to the author than was possible in this instance. The most promising form of interest test for the purpose was Peel's form of the 'meaning of words' test. As the outcome of his comparative study of methods of interest measurement[1] Angus concluded that 'the vocabulary test is the purest measure of interest'. Since it also provided a genuine test situation this form of interest stood out from the others as being the one likely to give the most reliable results.

As stated previously we aimed to measure interest in three groups of leisure time activities, intellectual, active and passive. Peel's form of test set up polarities between groups and so our test had to set

intellectual interests versus active interests
intellectual interests versus passive interests
active interests versus passive interests

It was therefore not one test, but three.

It should be pointed out that this study did not set out to find the merits of several types of test in determining one type of interest. It used one type of test, already found by at least one investigator to have more in its favour than the others, to determine several types of interest.

The findings of the interest tests were supplemented by selected case studies.

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[1] Comparative study of methods of Interest Measurement. L. Angus M.Ed Thesis, Durham. 1949

Construction of the Interest Tests

The construction of the vocabulary test of interest can be divided into three stages :-

a) preliminary selection of words from a variety of sources,

b) grading of words for difficulty and validity, as indicated by a separate test,

c) assembling words into subtests of approximately equal difficulty and validity.

This is similar to the procedure adopted in the construction of many other forms of mental test.(1)

First it was necessary to decide the type of material which would qualify for inclusion in any particular interest group, given the broad outlines previously quoted. Many helpful ideas in compiling the groups were obtained from the works of Terman and Wyman in particular, and also from the pamphlet 'Out-of-School' published by the Ministry of Education. The following selection was made :-

Intellectual pastimes

Stamp collecting	Card games	Paper and pencil games
Chess	Nature study	Lexicon
Draughts	Music	Monopoly

(1) The Validation of Test Items. Long and Sandiford
University of Toronto, Dept. of Educational Research
1935

Active and Athletic pastimes

Photography	Athletics
Household repairs	Association Football
Model ships and aeroplanes	Rugby
Radio construction	Cricket
Gardening	Swimming
	Rowing
	Hiking and camping

Passive interests

Radio programmes of a less serious nature
Films
Comics.

Enquiry was then made to see what words associated with these various topics would be most likely to be familiar to boys who were interested in them. Fruitful sources of information included

a) Intellectual and Active groups

Meccano Magazine

Hobbies Annual

A series of pamphlets on various sports issued by the National Union of Teachers in 1939

The daily press, particularly the special articles for children.

b) Passive group

Radio Times

Film advertisements and magazines

Comics collected from the appropriate age group in school by colleagues on the staff.

Three lists of words were finally produced containing

a) Intellectual group.....55 items

b) Active group.....72 items

c) Passive group. .....73 items

These lists form Appendix A.

In order to grade all items for difficulty and validity it was now necessary to present these 200 items to a set of children as similar as possible to those to whom the final test was to be given. Unfortunately 200 items would have been too many to present to each child since sufficient time had to be allowed for the children to attempt every item. To facilitate presentation of this preliminary test in schools, and also to avoid undue fatigue effects in the boys taking the test, it was therefore necessary to divide the words into four groups each of 50 words. Each group so formed contained comparable numbers of words from each interest group, the words being in random order.

	Test 1	Test 2	Test 3	Test 4
Intellectual	12	14	15	14
Active	20	18	18	16
Passive	18	18	17	20

In dividing the three lists into four tests every attempt was made to spread words from any one activity, e.g. chess, swimming etc. throughout the four tests and so reduce the likelihood of local conditions overweighting the score in some activity. The four tests are to be found in Appendix B.

Splitting the preliminary test into four parts in this way meant that each word was given to a much smaller number of boys than one would have liked, but the step was necessary on account of the large number of words involved. Each test was sent to a different grammar school where boys in their third year at the school were given enough time to write down whatever they knew about each of the 50 words on their list.

Marking the Preliminary test

Many words in each list were liable to more than one interpretation, e.g. draughts, size, ace, vice, tang, lock, pass, to mention but a few. It was necessary therefore to compile a marking list showing the permissible answers to each word, bearing in mind the type of interest that each word was required to indicate. Appendix C contains such a marking list for each of the four forms of the test. Many of the definitions used in these lists were very general since all boys could not be expected to use the same wording in their answers. If the spirit or sense of the answer was the same as that in the marking key the answer was accepted as correct. Thus the marking was made as nearly objective as possible.

Despite verbal instructions, given before the commencement of the test, to the effect that only one answer should be

written to each word, and that it should be the first one which suggested itself to the writer, a small number of boys insisted on giving alternatives. In this case the first answer written was taken to be the one required.

To start with each boy's paper was marked according to the marking key and the number of correct responses to each item was determined. This score was then converted to a percentage score and subtracted from 100 to give the measure of 'difficulty' of the word concerned. This was not the method of upper, middle and lower thirds which would normally be used when 'validity' was also to be found, because the number of boys involved in each test was small viz.

Test A.....27 boys
Test B.....35 boys
Test C.....30 boys
Test D.....31 boys

Two of these populations are not divisible by three and so an approximation had to be made in taking the upper and lower samples. Equal numbers were taken at the upper and lower ends of each test, leaving the remainder in the middle group. Summing the separate percentages in each group would not have given the same final figure as the true percentage found by taking the grand total for each item.

In order to validate the items each of the four tests had to be arranged in order of merit for :-

Firstly, intellectual interests

Secondly, active interests

Thirdly, passive interests

Owing to a) the small number of boys and

b) the small number of items of one particular interest group in each subtest it sometimes happened that it was more convenient to take a fraction slightly less than one third for the upper and lower third method of validation. For example, out of a population of say 33 boys the following distribution of scores might be obtained :-

Score	10	9	8	7	6	5
Frequency	2	7	8	7	6	3

To take nine boys in the upper and nine in the lower group seems a far more reasonable course than to select two boys with scores of 8 to bring the upper group to an exact third, and similarly to take two other boys with scores of 7 to complete the lower third. This treatment is supported by Kelley's having shown that the maximum benefit can be obtained from the upper and lower technique by taking, not the upper and lower thirds, but the upper and lower twenty-seven per cent. The numbers finally adopted were :-

Test	Total population	Number in U and L groups	%
A	27	9	33.3
B	35	10	28.6
C	30	8	26.7
D	31	9	29.0

In view of the small numbers involved, abd the subsequent approximations entailed, the figures obtained by subtracting the percentage of correct scores in the lower group from that in the upper group can, at best, be regarded as only rough estimates of item validity. Only four items were found to give negative scores of validity. (Table 1)

Table 1

Test A

Item	U	L	Difficulty 100 - Total	Validity U - L	
1	100	33	37	67	
4	89	22	41	67	
7	22	0	85	22	
19	89	89	11	0	
22	0	0	100	0	
27	11	0	96	11	
28	89	22	44	67	Intellectual
36	67	0	67	67	
37	89	22	48	67	
41	44	0	82	44	
44	100	67	11	33	
47	100	56	22	44	
3	0	0	93	0	
5	78	22	44	56	
8	100	89	7	11	
10	67	33	63	34	
12	56	44	41	12	
14	22	0	93	22	
15	0	0	100	0	
17	11	0	96	11	
20	33	0	93	33	
23	0	0	96	0	Active
25	44	0	74	44	
33	0	0	100	0	
34	89	0	48	89	
35	56	0	78	56	
38	78	22	44	56	
39	33	33	67	0	
43	67	33	44	34	
46	44	0	82	44	
49	11	11	85	0	
50	89	56	15	33	
2	100	67	11	33	
6	22	33	81	-11	
9	100	78	19	22	
11	0	11	85	-11	
13	100	78	7	22	
16	67	56	33	11	
18	100	11	48	89	
21	100	89	4	11	
24	100	100	0	0	Passive
26	78	44	33	34	
29	67	33	48	34	
30	89	56	30	33	
31	100	78	19	22	
32	100	100	4	0	
40	100	44	30	56	
42	89	67	15	22	
45	100	100	0	0	
48	100	44	33	56	

Test B

Item	U	L	Difficulty 100 - Total	Validity U - L	
4	3o	o	89	3o	
8	2o	o	74	2o	
9	5o	1o	74	4o	
13	1oo	5o	17	5o	
18	4o	o	83	4o	Intellectual
21	1oo	7o	17	3o	
22	9o	4o	29	5o	
37	9o	3o	34	6o	
4o	9o	2o	36	7o	
43	1oo	9o	3	1o	
48	1oo	9o	3	1o	
1	9o	2o	43	7o	
5	8o	4o	46	4o	
11	1oo	2o	43	8o	
14	7o	2o	57	5o	
16	2o	o	89	2o	
17	1oo	6o	26	4o	
24	1oo	7o	11	3o	Active
26	3o	o	8o	3o	
29	1oo	8o	9	2o	
33	1oo	5o	2o	5o	
34	8o	2o	51	6o	
38	8o	1o	6o	7o	
44	8o	7o	2o	1o	
46	7o	5o	37	2o	
47	o	o	97	o	
5o	1oo	3o	35	7o	
2	1oo	6o	2o	4o	
3	6o	2o	54	4o	
6	1oo	1oo	o	o	
7	3o	1o	8o	2o	
1o	1oo	7o	17	3o	
12	o	o	1oo	o	
15	1oo	9o	9	1o	
19	1oo	o	94	1o	
2o	1oo	8o	6	2o	
23	9o	6o	23	3o	Passive
25	1oo	8o	6	2o	
27	o	o	1oo	o	
28	8o	o	71	8o	
3o	o	o	1oo	o	
31	o	o	1oo	o	
32	1oo	8o	6	2o	
35	5o	o	71	5o	
36	1o	o	91	1o	
39	5o	1o	68	4o	
41	o	o	1oo	o	
42	1oo	9o	3	1o	
45	1oo	8o	6	2o	
49	1oo	8o	11	2o	

Test C

Item	U	L	Difficulty 100 - Total	Validity U - L	
1	88	25	37	63	
4	25	o	9o	25	
7	25	o	93	25	
1o	13	o	93	13	
13	1oo	88	7	12	
18	75	o	7o	75	
21	38	13	83	25	Intellectual
24	o	o	97	o	
27	13	o	9o	13	
3o	38	63	43	-25	
35	89	o	57	89	
38	38	o	87	38	
41	o	o	1oo	o	
44	88	75	17	13	
47	38	o	8o	38	
2	38	13	7o	25	
5	88	75	2o	13	
8	1oo	1oo	o	o	
11	88	25	43	63	
14	38	13	74	25	
16	88	38	3o	5o	
19	75	13	67	62	
22	88	25	43	63	
25	1oo	63	4o	37	Active
28	1oo	88	3	12	
31	63	13	5o	5o	
33	1oo	5o	1o	5o	
36	63	13	57	5o	
39	75	75	37	o	
42	o	o	1oo	o	
45	1oo	75	1o	25	
48	1oo	75	1o	25	
5o	63	63	23	o	
3	1oo	75	17	25	
6	38	13	74	25	
9	88	13	63	75	
12	1oo	75	1o	25	
15	1oo	88	1o	12	
17	o	25	9o	-25	
2o	1oo	1oo	o	o	
23	1oo	88	1o	12	
26	1oo	5o	2o	5o	Passive
29	1oo	88	3	12	
32	1oo	1oo	o	o	
34	88	13	67	75	
37	88	13	53	75	
4o	88	25	3o	63	
43	75	5o	37	25	
46	1oo	1oo	3	o	
49	1oo	88	3	12	

Test D

Item	U	L	Difficulty 100 - Total	Validity U - L	
2	56	o	77	56	
5	56	22	58	34	
8	loo	67	19	33	
11	loo	89	3	11	
21	56	11	68	45	
24	78	11	58	67	Intellectual
28	22	o	87	22	
31	89	56	26	23	
33	44	22	74	22	
36	89	67	26	22	
38	loo	33	19	67	
42	loo	loo	3	o	
46	loo	loo	o	o	
47	89	33	39	56	
3	o	o	loo	o	
6	loo	22	23	78	
9	89	11	45	78	
12					
14	89	89	13	o	
16					
19					
22	o	o	97	o	Active
26	o	o	loo	o	
3o	78	33	55	45	
35	56	o	77	56	
4o	44	11	81	33	
41	loo	loo	o	o	
44	loo	67	lo	33	
48	o	o	loo	o	
49	67	11	68	56	
1	22	11	9o	11	
4	loo	67	23	33	
7	loo	loo	13	o	
lo	33	11	87	22	
13	33	11	74	22	
15	67	o	58	67	
17	89	33	32	56	
18	loo	33	39	67	
2o	67	11	55	56	
23	loo	89	3	11	Passive
25	67	o	74	67	
27	33	o	81	33	
29	loo	22	39	78	
32	44	22	61	22	
34	89	89	lo	o	
37	loo	78	6	22	
39	78	56	26	22	
43	loo	33	23	67	
45	67	11	55	56	
5o	loo	loo	o	o	

Three items in the active interest group of Test D were discarded when it was found that knowledge of these items could have been acquired in Manual work in the school concerned. The situation did not arise elsewhere.

The items having been graded for difficulty and validated they were next listed in groups of approximately equal difficulty in order to show up easily the items of equal difficulty in the three different groups. (Table 2)

Table 2

Item Difficulty	Test	Intellectual Group	Active Group	Passive Group
5 to 14	A	Penny Black (11) Monopoly(11)	Vice (7)	The Iron Teacher (11) 'U' Film (7)
	B	Beech (3) Checkmate(3)	Square leg(11) Artificial Respiration (9)	James Cagney(9) Sam Costa (6) Danny Longlegs (6) Morgyn the Mighty (6) Humphrey Bogart (6) Lord Waterlog (11)
	C	Swallow (7)	Foul throw(10) Try (10) Sydney Wooderson(10)	David Niven(10) John Mills (10) Whippet Quick (10)
	D	Rookery (3) Lexicon (3)	No ball (13) Ground sheet (10)	Nick Smith(6) Mona Lott 9L Rip Magee (10)
15 to 24	A	Double blank (22)	Biplane (15)	Mr. Keen (19) Stalls (19) Sexton Blake (15)
	B	Warren(17) Deadly Nightshade (17)	Hacksaw (20) Crawl (20)	'A' Film(23) Reginald Dixon (17) M.G.M. (20)
	C	Crossword puzzle (17)	Fuse box(20) Cathie Gibson(23)	Arthur Lucan(17) Horace Hotplate(20)
	D	Ace (19) Trump suit (19)	Flex (23)	Snowey White (23) J. Arthur Rank(23)

Item Difficulty	Test	Intellectual Group	Active Group	Passive Group
25 to 34	A			Anne Shelton (33) Box office (33) Lipstone College (30) Edmundo Ros (30) Ethel Igginbottom(33)
	B	Pawn (29) Rook or Castle (34)	Bradawl (26)	
	C		Maureen Gardner(30)	Frisby (30)
	D	Briar (26) Sir Adrian Boult (26)		Dudley Davenport (32) Sophie Tuckshop (26)
35 to 44	A	Ash (44) Wagtail(41) Bishop's pawn (37)	Compost (44) Bevel (41) Jib-boom(44) Developer(44)	
	B	Limpet(36)	Guy rope(43) Fuselage(43) Jesse Owens (37) Rowlock (35)	
	C	Philatelist (37) Bat (43)	Fair charge (43) Stop cock(43) Hub (40) Tap washer (37)	Sam Spdger (37)
	D	Thomas Beecham(39)		Peter Lorre(39) Barry Fitzgerald(39)

Item Difficulty	Test	Intellectual Group	Active Group	Passive Group
45 to 54	A	Drone (48)	Jib (48)	Ralph Richardson (48) Ted Heath (48)
	B		Place kick(46) Pentathlon(51)	The Falcon(54)
	C		Knock on (50)	Mr. Muddlecombe (53)
	D		Cotter pin(45)	
55 to 64	A		No Jump (63)	
	B		Rawlplug(57) Plane Iron(60)	
	C	Watermark (57)	Spool (57)	Mr. Burp (63)
	D	Dummy Hand (58) Check(58)	Projection lens (55)	Orson Welles(58) Jackie Drake(55) Hon. Phoebe(61) Zachary Scott(55)
65 to 74	A	Mounts(67)	Alan Patterson(74) Tackle(67)	
	B	Solitaire (74) Blue Mauritius (74)		Dr. Oliver Dither(71) Wetherby Wet(71) Mr. Blake, the sexton(63)
	C	Perforation gauge (70)	Hypo (67) Hands(74) Negative(70)	Hambone Rep. Co. (74) Attendant(67)
	D	Andante(68) Stalemate (74)		Barry Steel(74) Academy Award(74)

Item Difficulty	Test	Intellectual Group	Active Group	Passive Group
75 to 84	A	Conifer(82)	Touch(78) Sweated jo(82) (82)	Trailer(81)
	B	Red Campion (83)	Variable condenser(80)	Tinker(80)
	C	Misere(83) Solo(80)		
	D	Stanley Gibbons(77)	Perennial(77)	Dicky Bumblebee(81)
85 to 94	A	Arpeggio(85)	Valve holder(93) Point(93) Pass(93) Tone arm(85)	St. Alfrics(85)
	B	Crustacean (89)	Bail (89)	Jimmy Topper(94) Oscar (91)
	C	Abundance (90) Grand slam (93) Ling(93) Anagram(90) Trick(87)		Star (90)
	D	Castling (87)		Phil Mason(87) Power(90)

From this table the final test was constructed by taking three of each type of item from the same difficulty group and using these to give the subtests previously described. In one or two cases it was necessary to go slightly outside the limits of the difficulty groups in order to obtain three items of one particular type of interest, but in no case did the range of item difficulty in any subtest exceed 10%.

Care was taken not to repeat words in different subtests if it could be avoided, although in many cases the number of words available in a difficulty group made repitition necessary.

The list of subtests was then jumbled to give a random order of difficulty, with the exception of preventing two subtests of the same type, such as intellectual interests versus active interests, from being adjacent. The items within each subtest were also listed at random to give the final form of the interest test. (Appendix D)

Administration of the Tests

Having been finally assembled, the battery of tests (Appendix D) consisting of the Ability test, the V.S.10, and the three-in-one interest test were sent, within a matter of days, to the following schools :-

1) an urban grammar school, having two graded streams in the appropriate age group.

A stream 28 boys

B stream 30 boys

This school is referred to as Grammar School A

2) a rural grammar school with only one form in the age group concerned, 26 boys.

Referred to afterwards as Grammar School B.

3) a large urban secondary modern school, the fathers of the boys being predominantly dockyard workers. This school had four graded streams in the age group

III_1 36 boys

III_2 31 boys

III_3 27 boys

III_4 25 boys

It was felt that this selection would give a sensibly normal distribution of ability.

By the kind co-operation of the headmasters concerned all the tests were applied within a matter of three weeks. This was very helpful in view of the seasonal nature of some

of the items in the active group of interests where a changeover from winter to summer sports might conceivably alter the interest score. Within any one school the tests themselves were spread over a much shorter period than this.

Grammar School A	two days
Grammar school B	two days
Modern School	one morning.

The instructions relative to each test were contained in the tests themselves and the timing of the Ability test and the V.S.10 was strictly observed. In the case of the interest test the boys were allowed as much time as they needed to attempt each subtest. The staffs of the schools supervised the tests in each case.

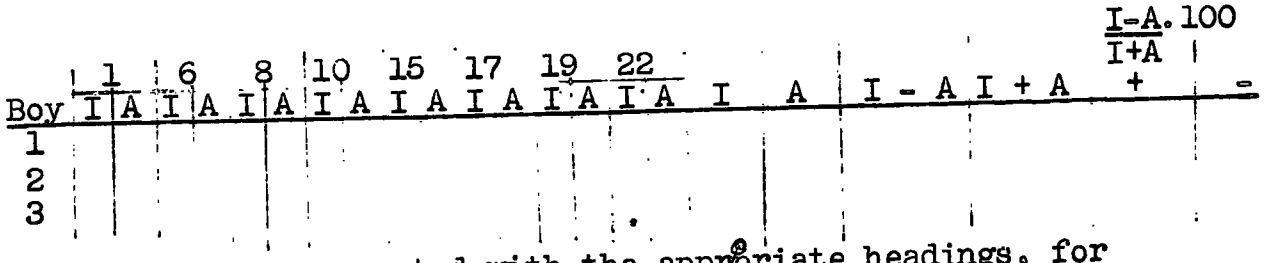
When these tests had been collected in and marked it was felt that a knowledge of Intelligence Quotients would be useful in addition to the raw scores obtained in the Ability test. Some three months later, then, the Otis tests were sent to the schools and these were administered by the schools themselves, as before. Again the instructions were strictly observed. Since the age of the pupil is taken into account in obtaining this I.Q. the time lag between this test and the others was deemed to be of very little importance.

PRESENTATION OF RESULTS.

Marking the Tests

The marking of all the tests was carried out by the writer. In the case of the Ability test, V.S.10 and Otis this was not necessary to produce uniformity. The interest tests, however, even with the guidance of the marking key, did leave some room for ambiguity on account of the reasons outlined in the validation process. In addition to marking according to the same conscious standards it was felt that uniformity would depend also on sub-conscious standards. The same person therefore should mark all items on the interest tests. The difference in score obtained by a variety of markers would not be large, the scoring key and sense of the answer would prevent that, but at least it would introduce another possible error.

The final scores in the interest tests were obtained by employing prepared score sheets. The three interest tests had been jumbled in the production of the final test and each set of subtests had to be sorted out and marked separately. The sheets were headed :-



The pattern was repeated, with the appropriate headings, for the other two tests.

In marking any subtest, then, the numbers of correct I responses and A responses were entered on the score sheet and the total I and A scores obtained by summing those from the subtests. The sum and difference columns lead up to the final interest score $\frac{I - A}{I + A} \cdot 100$ entered in the last column.

In the cases of some boys of low ability it was found that the total number of responses was very small and that the interest score obtained was exaggerated by the small divisor. To prevent this unreliability any scores with a total response less than six were scrapped, i.e.

if $I + A < 6$

$I + P < 6$

$A + P < 6$ the scores for that boy, in the entire battery of tests, were ruled out.

Reliability of the Interest Tests

From the score sheets obtained in the above fashion an attempt was made to estimate the reliability of each interest test by (1) Spearman's Split-Half formula $r = \frac{2r_o}{1 + r_o}$

where r is the measure of reliability and

r_o is the correlation coefficient between the two halves of the same test

(1) Statistics in Psychology and Education. H.E. Garrett Longmans Green and Co. Page 271

The procedure followed can be illustrated by reference to the Intellectual versus Active Interest test (I v A) only, since it was merely repeated for the (I v P) and (A v P) tests.

The subtests involved in the I v A interest test were 1 , 6 , 8 , 10 , 15 , 17 , 19 , 22 on the complete test. The scores in alternate subtests viz (1 , 8 , 15 , 19) (6 , 10 , 17 , 22) were used to obtain interest scores $\frac{I - A}{I + A} \cdot 100$ for each half of the test. Again total responses less than six in either half were deemed to give exaggerated interest scores and were left out. The figures obtained in this way are listed in Table 3.

Table 3

Split-half scores for intellectual versus active interests.

Half A (Subtests 1,8,15,19)				Half B (Subtests 6, 10,17,22)			
		$\frac{I-A}{I+A}\cdot 100$				$\frac{I-A}{I+A}\cdot 100$	
I	P	+	-	I	P	+	-
7	1	75		5	4	11	
6	5	9		3	6		33
4	4	0		4	6		20
6	2	50		3	3	0	
4	3	15		3	4		15
5	3	25		5	2	43	
7	3	40		3	2	20	
6	4	20		6	4	20	
5	4	11		6	3	33	
5	5	0		4	5		11
5	5	0		3	7		40
4	3	15		5	2	43	
6	4	20		7	2	55	
7	2	55		5	3	25	
4	4	0		7	4	27	
6	2	50		3	5		25
5	3	25		5	3	25	
6	4	20		3	4		15
6	2	50		5	2	43	
4	6		20	3	6		33
7	2	55		5	3	25	
4	5		11	4	8		33
3	3	0		4	4	0	
7	4	27		5	4	11	
3	3	0		3	4		15
4	3	15		5	4	11	
4	5		11	2	5		43
7	3	40		5	5	0	
5	4	11		3	6		33
5	5	0		4	3	15	
2	5		43	5	4	11	
3	4		15	1	7		75
4	2	33		7	2	55	
9	2	66		5	3	25	
3	6		33	3	3	0	
7	3	40		4	6		20
3	5		25	4	5		11
6	3	33		6	3	33	
5	6		9	3	6		33
9	2	66		3	5		25
4	3	15		2	4		33
3	6		33	1	6		78
1	5		67	4	4	0	
7	1	75		7	3	40	

(cont.)

Half A

I	A	$\frac{I-A}{I+A} \cdot 100$ +	-
4	5		11
4	5		11
7	4	27	
5	4	11	
6	3	33	
7	3	40	
8	3	44	
4	7		27
7	2	55	
4	4	0	
3	3	0	
4	4	0	
3	5		25
7	3	40	
4	3	15	
5	4	11	
6	3	33	
4	3	15	
4	3	15	
2	6		50
5	3	25	
5	4	11	
5	4	11	
4	4	0	
4	6		20
3	5		25
4	5		11
5	5	0	
5	5	0	
5	4	11	
6	3	33	
7	3	40	
4	5		11
1	5		67
5	4	11	
3	6		33
5	7		16
3	5		25
1	6		71
6	4	20	
4	2	33	
4	3	15	
5	3	25	
2	5		43
2	5		43
2	4		33
5	3	25	
2	4		33
4	2	33	

Half B

I	A	$\frac{I-A}{I+A} \cdot 100$ +	-
3	4		15
5	2	43	
5	3	25	
5	5	0	
3	4		15
5	3	25	
4	4	0	
4	5		11
5	5	0	
2	6		50
3	3	0	
1	5		67
4	4	0	
2	6		50
2	4		33
2	7		55
3	5		25
3	3	0	
1	5		67
5	4	11	
3	3	0	
2	4		33
2	5		43
2	4		33
3	5		25
1	5		67
6	2	50	
5	3	25	
3	5		25
4	3	15	
3	5		25
4	5		11
4	4	0	
2	4		33
4	4	0	
4	7		27
7	3	40	
1	7		75
2	4		33
4	4	0	
1	5		67
2	4		33
2	5		43
2	4		33
2	3		20
3	3	0	
2	5		43
1	5		67
2	4		33

Table 3

Split-half scores for intellectual versus passive interests.

Half A (Subtests 4,13,18,23.)				Half B (Subtests 2,9,16,20.)			
		$\frac{I-P}{I+P} \cdot 100$				$\frac{I-P}{I+P} \cdot 100$	
I	P	+	-	I	P	+	-
3	4		15	4	7		27
2	7		55	6	3	33	
4	6		20	4	6		20
5	4	11		3	4		15
4	6		20	4	5		11
3	6		33	7	3	40	
3	4		15	5	3	25	
3	6		33	5	3	25	
4	5		11	4	6		20
3	7		40	5	2	43	
5	6		9	10	1	82	
2	7		55	6	3	33	
2	5		43	5	5	0	
3	6		33	7	3	40	
2	4		33	3	3	0	
5	5		0	9	1	80	
0	7		100	3	6		33
5	6		9	5	3	25	
3	4		15	4	5		11
4	6		20	2	4		33
2	5		43	8	2	60	
4	6		20	4	4	0	
1	5		67	5	5	0	
4	4		0	6	1	71	
3	8		45	2	4		33
8	1	77		7	2	55	
4	5		11	7	5	16	
2	7		55	5	3	25	
3	8		45	5	4	11	
3	3		0	3	6		33
1	8		71	3	7		40
9	2	63		7	2	55	
3	3	0		5	2	43	
4	5		11	5	4	11	
2	7		55	4	3	15	
4	3	15		5	1	67	
4	7		27	5	3	25	
4	3	15		5	4	11	
6	6	0		6	4	20	

(cont.)

Half A		$\frac{I-P.100}{I+P}$	
I	P	+	-
2	4		33
3	6		33
5	3	25	
3	6		33
5	4	11	
4	6		20
2	6		50
6	4	20	
5	6		9
6	2	50	
3	6		33
3	6		33
5	6		9
5	3	25	
4	4	0	
6	4	20	
2	6		50
3	5		25
4	3	15	
4	5		11
4	7		27
4	6		20
2	7		55
5	6		9
2	5		43
6	1	71	
6	4	20	
5	3	25	
5	3	25	
5	5	0	
2	5		37
2	5		37
8	4	33	
3	5		25
4	2	33	
4	3	15	
4	4	0	
4	5		11
3	6		33
2	7		55
4	4	0	
5	6		9
3	5		25
5	3	25	
5	3	25	
3	5		25
3	6		33

Half B		$\frac{I-P.100}{I+P}$	
I	P	+	-
1	5		67
5	5		0
7	3	40	
7	4	27	
3	3	0	
5	6		9
4	5		11
3	6		33
6	3	33	
5	1	67	
7	2	55	
2	5		43
5	4	11	
6	4	20	
8	3	45	
4	3	15	
3	5		25
4	3	15	
6	2	50	
4	6		20
4	5		11
3	4		15
2	5		43
2	4		33
5	3	25	
6	1	71	
8	2	60	
7	3	40	
4	4	0	
6	4	20	
3	4		15
3	5		25
5	3	25	
8	1	77	
4	3	15	
3	4		15
7	1	75	
6	2	50	
4	5		11
2	5		43
5	4	11	
4	3	15	
2	6		50
5	2	43	
5	4	11	
2	4		33
1	7		75

(cont.)

Half A		I-P.100 / I+P	
I	P	+	-
3	5		25
1	7		75
4	5		11
5	4	11	
2	6		50
5	3	25	
2	7		55
1	5		67
3	7		40
3	7		40
5	7		16
8	2	60	
3	5		25
4	5		11
2	7		55
1	5		67
4	6		20
3	7		40
3	6		33
7	3	40	
1	8		77
2	5		43
2	4		33
7	4	28	
3	4		15
4	5		11
4	4		0
5	3	25	
4	4	0	
4	4	0	
3	5		25
3	5		25
4	3	15	
4	4	0	
1	6		71
4	5		11
2	5		43
1	7		75
2	6		50
2	7		55
1	7		75
3	5		25
1	5		67
4	5		11
2	5		43
3	6		33

Half B		I-P.100 / I+P	
I	P	+	-
5	3	25	
4	2	33	
5	3	25	
6	2	50	
3	5		25
6	2	50	
5	5	0	
4	4	0	
4	5		11
4	5		11
6	3	33	
4	2	33	
2	6		50
4	2	33	
5	4	11	
5	3	25	
6	3	33	
4	4	0	
6	2	50	
7	4	28	
2	5		43
2	7		55
1	6		71
5	3	25	
5	4	11	
4	3	15	
4	5		11
3	5		25
4	3	15	
4	5		11
2	5		43
2	7		55
6	3	33	
3	5		25
2	6		50
4	4		0
1	7		75
2	4		33
1	5		67
4	3	15	
5	4	11	
3	4		15
1	5		67
3	3		0
2	5		43
1	7		75

Table 3

Split-half scores for active versus passive interests.

Half A (Subtests 5,11,14,24)				Half B (Subtests 3,7,12,21)			
		$\frac{A-P}{A+P} \cdot 100$				$\frac{A-P}{A+P} \cdot 100$	
A	P	+	-	A	P	+	-
4	4	0		3	7		40
4	7		28	4	3	15	
3	8		45	5	4	11	
4	5		11	2	6		50
2	5		43	3	7		40
5	5	0					
3	6		33	5	2	43	
4	4	0		5	2	43	
5	5	0		3	3	0	
6	4	20		5	5	0	
4	6		20	4	2	33	
4	5		11	8	1	77	
2	10		67	2	4		33
7	4	28		5	2	43	
9	1	80		5	1	67	
4	7		28	2	5		43
3	7		40	4	4	0	
0	6		100	1	5		67
3	3	0		9	2	63	
5	5	0		5	2	43	
4	6		20	4	3	15	
6	3	33		6	1	71	
5	4	11		4	2	44	
4	7		27	4	6		20
5	5	0		4	2	33	
4	7		27	6	2	50	
4	2	33		4	2	33	
1	9		80	2	6		50
6	3	33		4	2	33	
3	5		25	3	4		15
3	5		25	2	4		33
4	5		11	5	4	11	
4	4	0		2	5		43
1	8		77	5	3	28	
4	6		20	4	2	33	
4	5		11	3	4		15
5	4	11		3	4		15
4	5		11	5	2	43	

(cont.)

Half A

A	P	$\frac{A-P}{A+P} \cdot 100$ +	-
6	4	20	
6	4	20	
7	5	16	
4	3	15	
1	8		77
4	3	15	
6	4	20	
1	5		67
7	4	27	
5	5	0	
4	5		11
5	6		9
7	5	16	
2	7		55
7	3	40	
5	5	0	
5	5	0	
3	6		33
4	5		11
5	3	25	
5	4	11	
3	6		33
3	6		33
3	8		45
3	7		40
2	6		50
5	6		9
5	6		9
4	6		20
5	6		9
3	6		33
4	6		20
5	5	0	
4	6		20
3	6		33
3	6		33
7	4	27	
2	6		50
4	5		11
5	6		9
4	6		20
2	5		43
3	4		15
2	6		50
1	5		67
2	5		43
3	3	0	

Half B

A	P	$\frac{A-P}{A+P} \cdot 100$ +	-
5	2	43	
5	2	43	
6	3	33	
7	1	75	
5	5	0	
5	2	43	
3	4		15
4	3	15	
4	1	60	
2	5	43	
5	5	0	
3	3	0	
4	3	15	
3	5		25
4	3	15	
3	4		15
2	5		43
2	4		33
3	3	0	
4	2	33	
4	3	15	
3	3	0	
3	4		15
2	5		43
1	6		71
4	3	15	
4	2	33	
3	5		25
4	3	15	
3	5		25
4	2	33	
5	3	25	
2	7		55
2	4		33
3	4		15
3	3	0	
4	2	33	
1	5		67
1	8		77
5	4	11	
3	3	0	
2	5		43
2	4		33
1	8		71
2	5		43
4	3	15	
3	4		15

A scattergram[1] was then plotted with the two interest scores thus obtained for each boy, and the correlation coefficient r_o obtained for the two halves of the test, using the Bravais-Pearson Product Moment formula

$$r_o = \frac{\Sigma ab}{\sqrt{\Sigma a^2 \cdot \Sigma b^2}}$$ where a and b are the scores in half A and Half B as measured from the mean of A and the mean of B.

Taking class intervals of ten in each half, A and B, of each interest test the distribution of scores was plotted by taking these intervals along rectangular axes - the scattergram.

The expressions

$$A = \frac{\Sigma fa^2}{N} - \left(\frac{\Sigma fa}{N}\right)^2$$ and

$$B = \frac{\Sigma fb^2}{N} - \left(\frac{\Sigma fb}{N}\right)^2$$ were evaluated

for the two distributions, N being the number of boys involved.

The distribution of scores along the diagonals of the elemental squares was also found to give

$$C = \frac{\Sigma fc^2}{N} - \left(\frac{\Sigma fc}{N}\right)^2$$

From these quantities A B and C the correlation coefficient

$$r_o = \frac{A + B - C}{2\sqrt{AB}}$$ which is equivalent to the form previously quoted. Spearman's formula then gave the measure of reliability r .

[1] Assessment of Psychological Qualities by Verbal Methods. P.E. Vernon
Page 108

The reliabilities of the three tests , as estimated by this method, turned out to be

Intellectual v Active interests	.440
Intellectual v Passive interests	.612
Active v Passive interests	.669

It should be borne in mind that these figures were obtained with very small numbers of items in each half. Four subtests only in each. With a longer test it is likely that these figures could be improved.

The Interest Scores

At this stage it is not out of place to give a table of the figures obtained in columns 10, 11, 14 , 15 of the score sheets shown earlier, and to draw some possible conclusions from these results. The figures are given for each form separately in Table 4, which includes also scores obtained with a total response less than six.

Table 4

Intellectual versus active interest scores

Grammar School A, A stream

Boy	I	A	$\frac{I-A}{I+A}.100$ +	$\frac{I-A}{I+A}.100$ −
1	12	5	41.2	
2	9	11		10.0
3	8	10		11.1
4	9	5	28.6	
5	6	5	9.1	
6	6	8		14.3
7	6	6	0	
8	7	7	0	
9	10	5	33.3	
10	10	5	33.3	
11	12	8	20.0	
12	11	7	21.1	
13	8	5	23.1	
14	9	10		5.3
15	4	8		28.6
16	8	12		20.0
17	9	5	28.6	
18	10	6	25.0	
19	13	6	36.8	
20	12	5	41.2	
21	11	8	15.8	
22	9	7	12.5	
23	6	6	0	
24	10	6	25.0	
25	9	8	5.9	
26	11	4	46.7	
27	7	12		26.3
28	12	5	41.2	

B stream

Boy	I	A	$\frac{I-A}{I+A}.100$ +	$\frac{I-A}{I+A}.100$ −
1	8	13		23.8
2	8	5	23.1	
3	7	7	0	
4	12	8	20.0	
5	9	5	14.3	
6	7	7	0	
7	6	7		7.7
8	5	6		9.1
9	9	7	12.5	
10	6	10		25.0
11	12	8	20.0	
12	5	6		9.1
13	9	4	38.5	
14	8	10		11.1
15	9	8	5.9	
16	5	6		9.1
17	5	7		16.7
18	7	9		12.5
19	4	11		46.7
20	3	6		33.3
21	11	4	46.7	
22	14	5	47.4	
23	6	9		20.0
24	11	9	10.0	
25	9	4	38.5	
26	7	10		17.6
27	12	6	33.3	
28	8	12		20.0
29	12	7	26.3	
30	6	7		7.7

Table 4

Grammar School B

Boy	I	A	$\frac{I-A}{I+A} \cdot 100$ +	$\frac{I-A}{I+A} \cdot 100$ −
1	5	9		28.6
2	7	6	7.7	
3	6	6	0	
4	4	12		50.0
5	5	9		28.6
6	14	4	55.5	
7	7	9		12.5
8	6	5	9.1	
9	9	7	12.5	
10	4	11		46.7
11	5	8		23.1
12	10	5	33.3	
13	12	8	20.0	
14	10	9	5.3	
15	4	10		42.8
16	9	7	12.5	
17	5	6		9.1
18	5	5	0	
19	12	6	33.3	
20	12	7	26.3	
21	7	6	7.7	
22	8	12		20.0
23	2	8		60.0
24	12	7	26.3	
25	8	10		11.1
26	6	6	0	

Table 4

Modern School

Boy	1st. stream I	A	I-A.100 I+A +	-
1	5	9		28.6
2	7	9		12.5
3	9	9	0	
4	4	7		27.3
5	6	7		7.7
6	3	8		45.4
7	7	11		22.2
8	9	8	5.9	
9	7	7	0	
10	7	6	7.7	
11	4	7		30.0
12	5	8		23.1
13	7	10		17.6
14	8	6	14.3	
15	6	7		7.7
16	7	8		6.7
17	7	9		12.5
18	6	8		14.3
19	7	11		22.2
20	7	4	27.3	
21	4	10		42.8
22	10	7	17.6	
23	10	8	11.1	
24	2	5		42.8
25	8	10		11.1
26	4	5		11.1
27	9	7	12.5	
28	9	8	5.9	
29	5	6		9.1
30	11	8	15.8	
31	4	5		11.1
32	8	9		5.9
33	3	9		50.0
34	9	8	5.9	
35	7	13		30.0
36	12	10	9.1	

Boy	2nd. stream I	A	I-A.100 I+A +	-
1	4	5		11.1
2	5	4	11.1	
3	3	6		33.3
4	4	12		50.0
5	3	8		45.4
6	3	5		25.0
7	4	7		27.3
8	6	6	0	
9	3	10		53.8
10	4	3	14.3	
11	6	4	20.0	
12	4	7		27.3
13	10	8	11.1	
14	5	7		16.7
15	3	4		14.3
16	7	5	16.7	
17	3	7		40.0
18	6	7		7.7
19	4	7		27.3
20	5	5	0	
21	7	6	7.7	
22	7	8		6.7
23	3	6		33.3
24	6	8		14.3
25	3	6		33.3
26	6	4	20.0	
27	4	10		42.8
28	4	9		38.4
29	4	8		33.3
30	3	4		14.3
31	6	5	9.9	

Table 4

Modern School

Boy	3rd. stream I	A	I-A.100/I+A +	-	Boy	4th. stream I	A	I-A.100/I+A +	-
1	3	4		14.3	1	7	4	27.3	
2	5	2	42.9		2	4	3	14.3	
3	2	4		33.3	3	3	5		25.0
4	5	7		16.7	4	6	6	0	
5	2	8		60.0	5	4	0		
6	1	5		66.7	6	3	0		
7	3	5		25.0	7	4	4	0	
8	6	7		7.7	8	4	6		20.0
9	3	7		40.0	9	3	4		14.3
10	6	4	20.0		10	4	3	14.3	
11	5	7		16.7	11	1	0		
12	6	7		7.7	12	2	7		56.6
13	4	3	14.3		13	3	6		33.3
14	1	5		66.7	14	2	1		
15	3	5		25.0	15	2	1		
16	3	9		50.0	16	4	5		11.1
17	2	7		55.5	17	3	4		14.3
18	3	6		33.3	18	3	3	0	
19	4	8		33.3	19	1	3		
20	3	8		45.5	20	1	3		
21	7	8		6.7	21	1	7		75.0
22	3	9		50.0	22	3	2		
23	3	6		33.3	23	1	8		77.8
24	5	6		9.1	24	1	3		
25	4	6		20.0					
26	3	3	0						
27	4	8		33.3					

Table 4

Intellectual versus passive interest scores

Grammar School A

A stream			I-P.100 / I+P	
Boy	I	P	+	-
1	7	11		22.2
2	8	10		11.1
3	8	12		20.0
4	8	8	0	
5	8	11		15.8
6	10	9	5.3	
7	8	7	6.7	
8	8	9		5.9
9	8	11		15.8
10	8	9		5.9
11	15	7	36.3	
12	8	10		11.1
13	7	10		17.6
14	10	9	5.3	
15	5	7		16.7
16	14	6	40.0	
17	3	13		78.5
18	10	9	5.3	
19	7	9		12.5
20	6	10		25.0
21	10	7	17.6	
22	8	10		11.1
23	6	10		25.0
24	10	5	33.3	
25	5	12		41.2
26	15	3	66.7	
27	11	10	4.8	
28	7	10		17.6

B stream			I-P.100 / I+P	
Boy	I	P	+	-
1	8	12		20.0
2	6	9		20.0
3	4	13		53.0
4	16	4	60.0	
5	8	5	23.1	
6	9	9	0	
7	6	10		25.0
8	9	4	38.5	
9	9	10		5.3
10	9	7	12.5	
11	12	10	9.1	
12	3	9		50.0
13	8	11		15.8
14	12	6	33.3	
15	10	10	0	
16	8	7	6.7	
17	1	11		83.4
18	9	12		14.3
19	7	7	0	
20	6	11		29.4
21	9	10		5.3
22	11	9	10.0	
23	11	3	57.8	
24	10	8	16.7	
25	5	11		37.5
26	10	10	0	
27	11	7	22.2	
28	12	7	26.3	
29	10	7	17.7	
30	5	11		37.5

Table 4

Grammar School B

Boy	I	P	$\frac{I-P}{I+P} \cdot 100$ +	$\frac{I-P}{I+P} \cdot 100$ -
1	8	5	23.1	
2	7	8		6.7
3	10	5	33.3	
4	8	11		15.8
5	6	4	20.0	
6	8	12		20.0
7	7	10		17.6
8	4	12		50.0
9	8	5	23.1	
10	7	10		17.6
11	7	8		6.7
12	12	2	71.4	
13	14	6	40.0	
14	12	6	33.3	
15	9	7	12.5	
16	11	9	10.0	
17	5	9		28.6
18	5	10		33.3
19	13	7	30.0	
20	11	6	29.4	
21	8	5	23.1	
22	6	7		7.7
23	7	7	0	
24	11	5	37.5	
25	10	7	17.6	
26	7	11		22.2

Table 4

Modern School

Boy	1st. stream I	P	I-P.100 / I+P +	-
1	4	12		50.0
2	9	8	5.9	
3	9	9	0	
4	4	9		38.4
5	5	8		23.1
6	5	11		37.5
7	10	5	33.3	
8	10	7	17.6	
9	7	9		12.5
10	4	13		52.9
11	7	4	27.3	
12	8	8	0	
13	5	9		28.6
14	9	8	5.9	
15	11	6	29.4	
16	5	11		37.5
17	6	5	9.1	
18	11	5	37.5	
19	7	12		26.3
20	5	9		28.6
21	7	12		26.3
22	7	12		26.3
23	11	10	4.8	
24	7	6	7.7	
25	12	4	50.0	
26	5	11		37.5
27	8	7	6.7	
28	7	11		22.2
29	6	8		14.3
30	10	9	5.3	
31	0	8		100
32	7	11		22.2
33	6	5	9.1	
34	6	6	0	
35	9	8	5.9	
36	14	7	33.3	

Boy	2nd. stream I	P	I-P.100 / I+P +	-
1	2	6		50.0
2	3	13		62.5
3	3	10		53.8
4	5	7		16.7
5	5	8		23.1
6	3	7		40.0
7	4	12		50.0
8	2	10		66.7
9	3	10		53.8
10	4	7		27.3
11	2	10		66.7
12	2	3		
13	12	7	26.3	
14	4	8		33.3
15	4	10		42.8
16	8	8	0	
17	2	5		42.8
18	7	4	27.3	
19	4	5		11.1
20	8	8	0	
21	8	9		5.9
22	8	8	0	
23	5	6		9.1
24	8	7	6.8	
25	6	1	71.4	
26	8	9		5.9
27	5	10		33.3
28	5	12		41.2
29	4	3	14.3	
30	10	6	25.0	
31	7	9		12.5

Table 4

Modern School

Boy	3rd. stream I	P	I-P.100/I+P +	−	Boy	4th. stream I	P	I-P.100/I+P +	−
1	0	5			1	4	1		
2	0	4			2	2	10		66.7
3	1	5		66.7	3	4	6		20.0
4	3	12		60.0	4	7	8		6.7
5	3	5		25.0	5	1	6		71.4
6	1	10		81.7	6	2	2		
7	4	5		11.1	7	0	6		100
8	8	9		5.9	8	0	2		
9	3	12		60.0	9	2	5		42.8
10	3	11		57.2	10	4	10		42.8
11	5	6		9.1	11	1	4		
12	2	10		66.7	12	1	1		
13	0	5			13	2	5		42.8
14	0	4			14	3	5		25.0
15	4	7		27.3	15	0	3		
16	1	6		71.4	16	0	2		
17	5	5	0		17	3	7		40.0
18	2	4		33.3	18	4	13		52.9
19	3	11		57.2	19	3	8		45.4
20	4	6		20.0	20	1	6		71.4
21	6	10		25.0	21	1	8		77.8
22	2	6		50.0	22	1	2		
23	6	11		29.4	23	1	3		
24	2	11		69.2	24	0	6		100
25	4	7		27.3	25	0	4		
26	1	6		71.4					
27	6	9		20.0					

Table 4

Active versus passive interest scores

Grammar School A

A stream			A-P.100 / A+P	
Boy	A	P	+	-
1	7	11		22.2
2	8	10		11.1
3	8	12		20.0
4	6	11		29.4
5	5	12		41.2
6	7	6	7.7	
7	8	8	0	
8	9	6	20.0	
9	8	5	23.1	
10	8	8	0	
11	14	2	75.0	
12	11	9	10.0	
13	4	9		38.4
14	8	8	0	
15	6	5	9.1	
16	12	6	33.3	
17	4	14		55.5
18	12	6	33.3	
19	14	2	75.0	
20	6	12		33.3
21	7	5	16.7	
22	7	11		22.2
23	1	11		83.3
24	8	3	45.5	
25	8	7	6.7	
26	8	1	77.7	
27	12	5	41.2	
28	5	10		33.3

B stream			A-P.100 / A+P	
Boy	A	P	+	-
1	10	7	17.7	
2	9	5	28.6	
3	8	9		5.9
4	12	4	50.0	
5	9	6	20.0	
6	7	5	16.7	
7	5	9		28.6
8	7	4	27.2	
9	8	13		23.8
10	9	7	12.5	
11	10	9	5.3	
12	8	4	33.3	
13	3	15		66.7
14	10	5	33.3	
15	6	9		20.0
16	8	5	23.1	
17	5	6		9.1
18	5	9		28.6
19	9	9	0	
20	5	10		33.3
21	6	9		20.0
22	6	11		29.4
23	10	1	81.8	
24	8	8	0	
25	7	9		12.5
26	8	8	0	
27	7	6	7.7	
28	9	7	12.5	
29	11	3	57.1	
30	7	5	16.7	

Table 4

Grammar School B

Boy	A	P	$\frac{A-P}{A+P}.100$ +	$\frac{A-P}{A+P}.100$ -
1	11	6	29.4	
2	11	6	29.4	
3	7	6	7.7	
4	13	8	23.7	
5	11	4	46.7	
6	6	13		36.8
7	7	8		6.7
8	6	7		7.7
9	9	5	23.5	
10	9	8	5.9	
11	5	8		23.1
12	8	3	45.4	
13	5	12		41.2
14	11	5	37.5	
15	6	7		7.7
16	7	10		17.6
17	7	6	7.7	
18	7	5	16.7	
19	9	10		5.3
20	8	9		5.9
21	11	2	69.3	
22	11	8	15.8	
23	5	12		41.2
24	11	6	29.4	
25	11	4	46.7	
26	8	9		5.9

Table 4

Modern School

Boy	1st. stream A	P	A-P.100 A+P +	-
1	5	9		28.6
2	7	9		12.5
3	7	10		17.6
4	5	10		33.3
5	5	4	11.1	
6	7	8		6.7
7	10	4	42.8	
8	5	12		41.2
9	4	8		33.3
10	4	10		42.8
11	9	5	28.6	
12	9	7	12.5	
13	3	8		45.5
14	6	8		14.3
15	6	9		20.0
16	6	10		25.0
17	8	4	33.3	
18	6	6	0	
19	5	13		44.4
20	2	8		60.0
21	4	13		53.0
22	6	9		20.0
23	9	8	5.9	
24	4	7		27.3
25	8	7	6.7	
26	7	7	0	
27	8	7	6.7	
28	8	11		15.8
29	8	7	6.7	
30	8	9		5.9
31	3	9		50.0
32	8	11		15.8
33	6	2	50.0	
34	7	8		6.7
35	9	9	0	
36	7	12		26.3

Boy	2nd. stream A	P	A-P.100 A+P +	-
1	4	7		27.3
2	3	11		57.2
3	6	10		25.0
4	6	6	0	
5	6	7		7.7
6	3	5		25.0
7	5	10		33.3
8	6	10		25.0
9	4	11		46.7
10	4	8		33.3
11	5	10		33.3
12	3	3	0	
13	6	9		20.0
14	11	6	29.4	
15	3	11		57.2
16	3	10		53.8
17	2	6		50.0
18	7	6	7.7	
19	5	6		9.1
20	5	13		44.4
21	4	9		38.4
22	10	10	0	
23	2	7		55.5
24	7	5	16.7	
25	4	3	14.3	
26	6	6	0	
27	7	9		12.5
28	4	10		42.8
29	8	5	23.1	
30	8	4	33.3	
31	3	16		68.4

Table 4

Modern School

Boy	3rd. stream A	P	A-P.100/A+P +	-
1	3	6		33.3
2	2	3		
3	3	2		
4	5	8		23.1
5	7	2	55.5	
6	1	10		81.7
7	3	5		25.0
8	3	12		60.0
9	3	10		53.8
10	5	6		9.1
11	9	6	20.0	
12	2	9		63.7
13	1	6		71.4
14	4	2	33.3	
15	1	9		80.0
16	4	4	0	
17	7	2	55.5	
18	1	6		71.4
19	2	6		50.0
20	7	5	16.7	
21	6	6	0	
22	5	8		23.1
23	6	8		14.3
24	6	7		7.7
25	5	6		9.1
26	3	7		40.0
27	7	4	27.2	

Boy	4th. stream A	P	A-P.100/A+P +	-
1	1	2		
2	2	6		50.0
3	4	3	14.3	
4	4	6		20.0
5	1	3		
6	2	2		
7	3	4		14.3
8	1	2		
9	5	3	25.0	
10	4	10		42.8
11	1	5		66.7
12	2	1		
13	2	2		
14	3	3	0	
15	0	5		
16	0	2		
17	3	7		40.0
18	4	8		33.3
19	3	6		33.3
20	3	5		25.0
21	3	8		45.4
22	4	5		11.1
23	0	1		
24	5	2	42.8	
25	1	3		

What the writer chooses to call a 'Group Interest Score' was now evaluated for each form by summing columns 10 and 11 of the score sheet (columns 2 and 3 of Table 4) to find the total I score and the total A score and from these finding $\frac{I - A}{I + A} .100$ for each form as a whole. A similar treatment was carried out for I v P and A v P scores, yielding :-

Group Interest Scores

School	Form	I v A	I v P	A v P
GrammarA	IVa	+12.0	- 3.2	+ 1.4
	IVb	+ 3.7	0	+ 3.3
GrammarB		- 1.0	+ 6.2	+ 8.1
Modern	III_1	- 8.7	- 7.0	-13.1
	III_2	-16.2	-19.3	-21.8
	III_3	-25.0	-43.7	-20.0
	III_4	-11.4	-48.0	-26.1

Two interesting trends are shown by these figures. First, leaving out Grammar School B and taking the grading of the streams in Grammar School A and the Modern school to be an indication of educational ability the I v A column indicates a shift from intellectual towards active interests as the ability falls off. The anomalous result for form III_4 of the Modern School may be due to the inability of members of this form to express themselves in the written answers to the subtests.

Similar drifts from intellectual towards passive interests and from active towards passive interests as ability falls off are shown in the I v P and A v P columns. The anomalies in these cases are much smaller and may be due to random

variations.

It is perhaps worth recalling that both Grammar School A and the Modern School are urban schools so that the boys from each have roughly the same opportunities for developing interests in any particular direction. There are grounds for supposing that lack of ability in the educational field may be coupled in some degree with a general lack of drive, resulting perhaps from low reserves of mental or physical energy, since a lower educational ability is associated with a bigger score in the 'passive' direction.

A more detailed examination of the relationship between abilities and interests will follow later.

Perhaps more interesting is the second trend shown by comparing the urban Grammar School A with the rural Grammar School B. The interest of the rural group is markedly more towards the active in the I v A test and in the A v P test. The inference seems to be that the rural environment fosters more active and practical interests than does the urban : lack of library facilities acting indirectly against intellectual interests, and a similar lack of picturegoing facilities and newsagents acting against the passive group. Coupled with these factors is the harsh necessity in many country areas of doing practical jobs in the household, instead of calling in a tradesman as the city dweller so often does.

This suggestion is further borne out by movement away

from passive interests in the rural I v P score. The items in the passive group of interests are likely to be affected by rural conditions to a greater extent than those in the intellectual group, of which nature study formed one section, but the more active and practical habits necessitated by life in the country produce by far the most marked effect.

The low reserves of physical energy mentioned earlier may also play their part in these results since it is agreed that country dwellers in general are better fed than townsfolk. The extra physical energy thus acquired , in addition to environment, probably contributes to the higher active scores in the rural school.

The results afford useful evidence that this type of test is in fact capable of differentiating between various types of interests, and between the interests of different environmental groups of people.

The same conclusions can be reached by treating the results in a rather different way, that is, by finding the interest score of each boy and then finding the average for each form. This involves the scrapping of those results with a total response below six, as explained earlier, and produced the following table

Average Interest Scores

School	Form	I v A	I v P	A v P
Grammar A	IVa	+13.3	- 4.7	+ 3.6
	IVb	+2.2	- 2.1	+ 5.5
Grammar B		- 3.2	+ 4.6	+ 9.1
Modern	III_1	- 9.9	- 7.9	-12.3
	III_2	-15.4	-19.2	-21.4
	III_3	-28.0	-39.9	-19.9
	III_4	-16.5	-49.3	-21.6

This table shows the same trends as the previous one, as might be expected since they were both derived from the same fundamental data.

Distribution of Scores

From a consideration of the interest scores themselves and their implications we turn next to the distributions of the scores in all the tests. Table 5 sets out the scores obtained by each boy in all the tests, leaving out those where interest scores were likely to be exaggerated.

The results were treated in a manner similar to that adopted by Terman[1] in comparing gifted and normal children although it is not suggested that the present groups bear that relationship to each other. The grammar school and modern school populations were treated separately, giving the distributions in Table 6, from which were found the means, standard deviations and standard errors summarised in Table 7.

[1] Genetic Studies of Genius. L.M. Terman op.cit.

Table 5

Summary of test scores

Grammar School A

A stream

Boy	I v A		I v P		A v P		VS.10	Ability	Otis
	+	-	+	-	+	-			
1	41.2			22.2		22.2	23	87	134
2		10.0		11.1		11.1	18	73	122
3		11.1		20.0		2o.o	25	76	12o
4	28.6		o			29.4		8o	111
5	9.1			15.8		41.2		85	119
6		14.3	5.3		7.7		28	86	121
7	o		6.7		o		22	75	126
8	o			5.9	33.3		24	79	115
9	33.3			15.8	23.1		25	82	123
1o	33.3			5.9	o		23	72	1o2
11	2o.o		36.3		75.o		28	81	136
12	21.1			11.1	1o.o			68	118
13	23.1			17.6		38.4	23	76	121
14		5.3	5.3		o		25	78	133
15		28.6		16.7	9.1		22	75	126
16		2o.o	4o.o		33.3		22	73	127
17	28.6			78.5		55.5		74	123
18	25.o		5.3		33.3		25	81	123
19	36.8			12.5	75.o		25	84	12o
2o	41.2			25.o		33.3	27	86	134
21	15.8		17.6		16.7		27	81	124
22	12.5			11.1		22.2	22	71	112
23	o			25.o		83.3	2o	85	132
24	25.o		33.3		45.5		23	8o	122
25	5.9			41.2	6.7		22	61	113
26	46.7		66.7		77.7		22	78	119
27		26.3	4.8		41.2		25	76	117
28	41.2			17.6		33.3	27	82	113

Table 5

Grammar School A

B stream

Boy	I v A		I v P		A v P		VS.10	Ability	Otis
	+	-	+	-	+	-			
1		23.8		2o.o	17.7		26	72	116
2	23.1			2o.o	28.6		24	75	1o9
3	o			53.o		5.9		76	121
4	2o.o		6o.o		5o.o		23	69	115
5	14.3		23.1		2o.o			61	112
6	o		o		16.7		29	66	1o3
7		7.7		25.o		28.6	23	68	113
8		9.1	38.5		27.2		16	76	
9	12.5			5.3		23.8	24	78	123
1o		25.o	12.5		12.5		26	67	11o
11	2o.o		9.1		5.3		24	72	121
12		9.1		5o.o	33.3		24	71	113
13	38.5			15.8		66.7		65	96
14		11.1	33.3		33.3		24	75	1o7
15	5.9		o			2o.o	25	87	125
16		9.1	6.7		23.1			66	1o4
17		16.7		83.4		9.1	19	73	117
18		12.5		14.3		28.6	25	76	118
19		46.7	o		o		19	5o	96
2o		33.3		29.4		33.3	2o	61	1oo
21	46.7			5.3		2o.o	27	67	1o5
22	47.4		1o.o			29.4	24	83	118
23		2o.o	57.2		81.8		23	69	114
24	1o.o		16.7		o		24	87	128
25	38.5			37.5		12.5	19	69	1o3
26		17.6	o		o		27	71	122
27	33.3		22.2		7.7		13	71	119
28		2o.o	26.3		12.5		26	86	117
29	26.3		17.7		57.1		23	77	119
3o		7.7		37.5	16.7		23	71	1o7

Table 5

Grammar School B

Boy	I v A +	I v A -	I v P +	I v P -	A v P +	A v P -	VS.10	Ability	Otis
1		28.6	23.1		29.4		22	71	114
2	7.7			6.7	29.4		2o	66	119
3	o		33.3		7.7		23	83	119
4		5o.o		15.8	23.7		23	78	123
5		28.6	2o.o		46.7		27	84	
6	55.5			2o.o		36.8	27	88	
7		12.5		17.6		6.7	25	83	1o7
8	9.1			5o.o		7.7	2o	73	1o6
9	12.5		23.1		23.5		24	73	
1o		46.7		17.6	5.9		23	83	118
11		23.1		6.7		23.1	29	82	111
12	33.3		71.4		45.4			79	115
13	2o.o		4o.o			41.2	23	72	1o6
14	5.3		33.3		37.5		26	76	
15		42.8	12.5			7.7	27	8o	111
16	12.5		1o.o			17.6	26	7o	117
17		9.1		28.6	7.7		24	76	114
18	o			33.3	16.7		23	69	1o3
19	33.3		3o.o			5.3	29	77	126
2o	26.3		29.4			5.9	28	8o	13o
21	7.7		23.1		69.3		23	67	113
22		2o.o		7.7	15.8		24	67	1o3
23		6o.o	o			41.2	21	74	1o6
24	26.3		37.5		29.4		27	83	123
25		11.1	17.6		46.7		27	7[illegible]	121
26	o			22.2		5.9	24	81	125

Table 5

Modern School

1st. stream

Boy	I v A		I v P		A v P		VS.10	Ability	Otis
	+	-	+	-	+	-			
1		28.6		5o.o		28.6	15	57	1o3
2		12.5	5.9			12.5	18	7o	1o7
3	o		o			17.6	26	77	1o9
4		27.3		38.4		33.3	13	44	97
5		7.7		23.1	11.1		15	54	1o4
6		45.4		37.5		6.7	17	73	11o
7		22.2	33.3		42.8		17	74	1o7
8	5.9		17.6			41.2	19	68	1o6
9	o			12.5		33.3	21	76	1o6
1o	7.7			52.9		42.8	18	48	99
11		3o.o	27.3		28.6		22	76	1o9
12		23.1	o		12.5		27	78	111
13		17.6		28.6		45.5	21	76	11o
14	14.3		5.9			14.3	18	7o	115
15		7.7	29.4			2o.o	16	78	114
16		6.7		37.5		25.o	21	75	114
17		12.5	9.1		33.3		23	81	92
18		14.3	37.5		o		25	78	1o5
19		22.2		26.3		44.4	19	71	1o5
2o	27.3			28.6		6o.o	21	57	11o
21		42.8		26.3		52.9	2o	79	111
22	17.6			26.3		2o.o	17	63	113
23	11.1		4.8		5.9		25	74	1o9
24		42.8	7.7			27.3	24	73	115
25		11.1	5o.o		6.7		23	75	117
26		11.1		37.5	o		23	63	1o6
27	12.5		6.7		6.7		16	71	1o9
28	5.9			22.2		15.8	23	77	1o1
29		9.1		14.3	6.7		16	69	1o5
3o	15.8		5.8			5.9	21	7o	1o9
31		11.1		1oo		5o.o	21	64	96
32		5.9		22.2		15.8	18	73	115
33		5o.o	9.1		5o.o		25	71	1oo
34	5.9		o			6.7	22	76	1o8
35		3o.o	5.9		o		25	75	1o7
36	9.1		33.3			26.3	21	63	112

Table 5

Modern School

2nd. stream

Boy	I v A +	I v A -	I v P +	I v P -	A v P +	A v P -	VS.10	Ability	Otis
1		11.1		5o.o		27.3	2o	53	1o4
2	11.1			62.5		57.2	25	58	1o3
3		33.3		53.8		25.o	24	56	89
4		5o.o		16.7	o		19	62	1o2
5		45.4		23.2		7.7	24	59	1o1
6		25.o		4o.o		25.o	17	49	96
7		27.3		5o.o		33.3	2o	43	1o6
8	o			66.7		25.o	17	62	98
9		53.8		53.8		46.7	22	53	98
1o	14.3			27.3		33.3	23	64	1o1
11	2o.o			66.7		33.3	16	81	1o9
12	11.1		26.3			2o.o	2o	75	11o
13		16.7		33.3	29.4		15	66	99
14		14.3		42.8		57.2	15	45	95
15	16.7		o			53.8	2o	67	1o3
16		4o.o		42.8		5o.o	23	61	113
17		7.7	27.3		7.7		21	61	1o3
18		27.3		11.1		9.1	13	5o	1o6
19	o		o			44.4	21	63	1oo
2o	7.7			5.9		38.4	12	62	1oo
21		6.7	o		o		24	63	1o3
22		33.3		9.1		55.5	23	65	114
23		14.3	6.7		16.7		15	48	1oo
24		33.3	71.4		14.3		25	63	1o6
25	2o.o			5.9	o		16	59	
26		42.8		33.3		12.5	18	5o	1o5
27		38.4		41.2		42.8	2o	6.	1o1
28		33.3	14.3		23.1		18	52	1oo
29		14.3	25.o		3o.o		17	68	1o8
3o	9.9			12.5		68.4	27	65	1o8

Table 5

Modern School

3rd stream

Boy	I v A +	I v A -	I v P +	I v P -	A v P +	A v P -	VS.10	Ability	Otis
1		16.7		60.0		23.1	16	55	97
2		60.0		25.0	55.5		10	53	98
3		66.7		81.7		81.7	8	41	93
4		25.0		11.1		25.0	12	35	85
5		7.7		5.9		60.0	10	49	97
6		40.0		60.0		53.8	12	43	89
7	20.0			57.2		9.1	15	42	89
8		16.7		9.1	20.0		13	44	98
9		7.7		66.7		63.7	18	51	99
10		25.0		27.3		80.0	16	62	91
11		50.0		71.4	0		15	35	90
12		55.5	0		55.5		12	33	100
13		33.3		33.3		71.4	10	38	88
14		3313		57.2		50.0	5	39	90
15		45.5		20.0	16.7		14	49	86
16		6.7		25.0	0		11	49	
17		50.0		50.0		23.1	19	49	98
18		33.3		29.4		14.3	17	38	89
19		9.1		69.2		7.7	11	41	83
20		20.0		27.3		9.1	19	49	93
21	0			71.4		40.0	21	51	95
22		33.3		20.0	27.2		20	54	101

4th stream

Boy	I v A +	I v A -	I v P +	I v P -	A v P +	A v P -	VS.10	Ability	Otis
1	14.3			66.7		50.0	19	46	84
2		25.0		20.0	14.3		15	35	90
3	0			6.8		20.0	12	33	94
4	0			100		14.3	11	20	84
5		20.0		42.8	25.0		16	29	78
6		14.3		42.8		42.8	12	23	81
7		33.3		25.0	0		12	28	78
8		11.1		40.0		40.0	14	43	
9		14.3		52.9		33.3	16	36	87
10	0			45.4		33.3	13	36	84
11		77.8		100		42.8	13	39	80

Table 6

Distribution of test scores

Interval	I v A		I v P		A v P	
	Grammar	Modern	Grammar	Modern	Grammar	Modern
90-100						
80.1-90					1	
70.1-80			1	1	3	
60.1-70			1		1	
50.1-60	1		2		1	2
40.1-50	6			1	6	2
30.1-40	8		9	3	6	2
20.1-30	10	1	8	5	9	5
10.1-20	10	13	7	2	9	7
0.1-10	8	7	9	10	9	5
-9.9-0	15	19	13	13	14	17
-19.9-10	9	17	14	6	3	8
-29.9-20	11	13	11	19	11	15
-39.9-30	1	12	3	7	5	8
-49.9-40	3	8	1	8	3	11
-59.9-50	1	6	3	10	1	10
-69.9-60	1	2		8	1	4
-79.9-70		1	1	2		1
-89.9-80			1	1	1	2
-99.9-90				3		

VS.10

Interval	Grammar	Modern
27-29	16	2
24-26	26	11
21-23	23	20
18-20	8	21
15-17	1	23
12-14	1	14
9-11		6
6- 8		1
3- 5		1
1- 3		

Table 6

Ability			Otis		
Interval	Grammar	Modern	Interval	Grammar	Modern
86-9o	7		136-14o	1	
81-85	16	2	131-135	4	
76-8o	2o	1o	126-13o	6	
71-75	21	12	121-125	17	
66-7o	15	9	116-12o	17	1
61-65	4	16	111-115	16	11
56-6o		6	1o6-11o	8	22
51-55		9	1o1-1o5	7	17
46-5o	1	11	96-1oo	3	19
41-45		9	91-95		7
36-4o		5	86-9o		1o
31-35		6	81-85		6
26-3o		2	76-8o		3
21-25		1	71-75		
16-2o		1			

Table 7

Test	School	Range	Mean	Stan. Dev.	S.E. of mean
I v A	Grammar	-6o.o to +55.5	3.22	26.o	2.84
	Modern	-77.8 to +27.3	-17.5	22.5	2.26
I v P	Grammar	-83.4 to +71.4	-1.31	29.8	3.25
	Modern	-100 to +71.4	-24.2	31.o	3.11
A v P	Grammar	-83.3 to +81.8	4.88	33.o	3.6o
	Modern	-81.7 to +55.5	-19.o	3o.6	3.o7
VSlO	Grammar	13 to 29	23.8	5.29	.787
	Modern	5 to 27	18.1	4.74	.476
Ability	Grammar	5o to 88	75.7	7.3o	.796
	Modern	2o to 81	56.o	14.7	1.48
Otis (IQ)	Grammar	96 to 136	116.7	8.84	.995
	Modern	78 to 117	loo.1	9.57	.976

Table 7a

Percentile Distribution

		1	25	5o	75	loo
I v A	Grammar	-6o.o	-12.5	+ 5o3	+25.o	+55.5
	Modern	-77.8	-33.3	-14.3	o	+27.3
I v P	Grammar	-83.4	-17.6	o	+2o.o	+71.4
	Modern	-loo	-45.4	-25.o	o	+71.4
A v P	Grammar	-83.3	-2o.o	+6.7	+27.2	+81.8
	Modern	-81.7	-42.8	-2o.o	o	+55.5

The means in column four of Table 7 show again the trend mentioned earlier. As we go from a grammar school population to that of a modern school there is a distinct movement away from intellectual interests in the first and second cases, and an equally marked movement towards passive interests in the second and third tests,

The drift away from intellectual interests is in line with the tentative hypothesis. Those in the modern school are less likely to have the mental equipment necessary to sustain intellectual interests. Less predictable are the almost equal changes towards passive interests in both the I v P and A v P tests. Admittedly there is more interest shown generally in the active group than in the intellectual in these two tests, but in each case the amount of movement into the passive region is about the same, 22.0 points in the I v P test and 23.9 points in the A v P test. If it was only a question of mental equipment a bigger change might have been expected in the former test than in the latter. It seems as though a kind of inertia, mental and physical, is in some measure responsible for the modern school scores. Recent research (1) Ghareib has suggested the existence of a quality closely related to application and industry, as earlier mentioned by (2) Alexander. There appears to be a distinct possibility that such a

(1) Factorial Analysis of Practical Ability and its relation to other intellectual qualities and personality traits. R.M. El Ghareib. Unpub. Ph.D. Thesis, Edinburgh

(2) Intelligence, Concrete and Abstract. W.P.Alexander Monograph 19. Brit. Journal of Psychology, 1935

quality could produce the changes seen in Table 7.

It is encouraging too that the standard errors of the means show the changes to be significant in the statistical sense. As the standard error of the difference between the means is less than the sum of the two standard errors it has not been included in the table.

The shifts in means in the Otis, Ability and V.S.10 scores imply that each of these tests should correlate positively to some degree with the three interest scores. This point will be studied more closely in the next stage. They also bear out the points previously made, namely that lack of mental equipment might be at least a part cause of the movement away from intellectual interests.

Table 7a, the percentile distributions, shows the same effects from a slightly different viewpoint.

Correlations

Following the procedure mentioned in dealing with test reliablities scattergrams were plotted for all the possible pairs of tests listed in Table 5, and the corresponding correlation coefficients evaluated. The standard error[1] of each coefficient was also found from the expression

$$S.E._r = \frac{1 - r^2}{N}$$, N being the number of scores.

For the six tests used then fifteen scattergrams were plotted.

The correlation coefficients obtained are summarised in Table 8

[1] The Factorial Analysis of Human Ability. G.H. Thomson
Page 148 University of London Press

Table 8

Correlation Coefficients

Test	I v A	I v P	A v P	VS.10	Ability	Otis
I v A						
I v P	.227 (.070)					
A v P	.041 (.074)	.535 (.053)				
VS.10	.345 (.067)	.408 (.063)	.262 (.071)			
Ability	.376 (.063)	.476 (.057)	.226 (.070)	.725 (.036)		
Otis	.393 (.064)	.464 (.059)	.258 (.071)	.647 (.045)	.817 (.025)	

the standard error of each coefficient being shown in brackets underneath the coefficient itself.

The first feature which appears in the table is that each interest measure correlates positively with each ability measure, showing that abstract ability plays a part in the development of intellectual and, to a lesser degree, active interests. The average value for the correlation of the I v P test with the Ability tests is 0.45 whilst that for the A v P test with the ability tests is only 0.25. Confirmatory evidence is afforded by the positive correlations of the I v A test with the ability tests. The corollary that boys in whom intellectual interests have been developed and fostered have thereby been increased in mental stature cannot be ruled out as utterly impossible.

Both the I v A and I v P tests correlate less with V.S.10 than they do with the Ability and Otis tests. On the other hand the A v P test correlates higher with V.S.10 than with the other two. Since V.S.10 is acknowledged as a test capable of distinguishing between those with practical ability and those of purely academic tendencies it can be concluded that, to a small extent at least, practical ability begets practical and active interests. Again the possibility must be allowed that such interests, deliberately instilled and cultivated, might increase a boy's practical ability.

The higher correlation of V.S.10 with the Ability test than with the Otis Test can be accounted for by the fact that the last section of the Ability test contained items

very similar in many ways to those of V.S.10, whereas no such items appeared on the Otis test. Further, the Otis was the only test in which the final scores were scaled for age differences.

A further feature of the correlations is the value obtained for the A v P test with the I v A and I v P tests, .041 and .535 respectively. One is tempted to infer from this that passive interests are more general throughout the sample of boys tested than are the other two types, and that this common core of passive interests accounts for the relatively high correlation coefficient (.535) obtained between two tests which set passive interests against quite different items in each instance.

The 'inertia' effect already mentioned may account for this. It is common to all, but in those in which it is most marked it prevents the development of interests requiring drive or energy in either physical or mental form.

The degree of correlation of each interest test with the ability tests is very consistent.

I v A	0.3...
I v P	0.4...
A v P	0.2...

suggesting that each test is measuring something different, to give the change of value, and something definite, to account for the consistent figures.

Factorial Analysis of the Correlations

Multiple factor theory is based on the assumption that a score S_a in test A is due to the summation of separate factors, or aspects, of the test itself, such that if a test contains factor variables x_1, x_2, x_3.... each weighted by a corresponding loading a_1, a_2, a_3.... then

$$S_a = a_1x_1 + a_2 x_2 + a_3x_3 + ...$$

A second test B may contain the same factors, to give a score

$$S_b = b_1x_1 + b_2x_2 + b_3x_3 + ...$$

The different scores in the two tests are seen to be due to the different loadings ascribed to the factors.

The scores S_a, S_b etc. must be standard scores, in which case $\frac{\Sigma(S_a)^2}{N} = 1$

In addition to the common factors x_1, x_2, x_3 ..... each test will probably measure something unique, the specific of the test, so that

$$S_a = a_1x_1 + a_2x_2 + a_3x_3 + ... + (k_ay_a)$$

where (k_ay_a) is the specific factor.

Then $\frac{\Sigma(S_a)^2}{N} = \frac{\Sigma a_i^2x_i^2}{N} + 2\frac{\Sigma a_i a_k x_i x_k}{N}$

$= 1$

For independant, i.e. orthogonal factors, x_1, x_2, x_3.. are uncorrelated and $\frac{\Sigma x_i^2}{N} = 1$

$\therefore a_1^2 + a_2^2 + a_3^2 + \quad \ldots\ldots + k_a^2 = 1$

and $b1^2 + b_2^2 + b_3^2 + \quad \ldots\ldots + k_b^2 = 1$ etc.

The communality, or the amount of the test accounted for by the common factors is therefore

$$a_1^2 + a_2^2 + a_3^2 + \quad \ldots\ldots = 1 - k_a^2$$

Similarly $\dfrac{\Sigma S_a S_b}{N} = \dfrac{\Sigma a_i b_i x_i^2}{N} + 2\dfrac{\Sigma a_i b_k x_i x_k}{N}$

But k_a, k_b disappear

$$\therefore \frac{\Sigma S_a S_b}{N} = a_1 b_1 + a_2 b_2 + a_3 b_3 + \ldots\ldots$$

$$= r_{ab} \text{ by definition.}$$

From the matrix of correlation

K_a^2	r_{ab}	r_{ac}
r_{ab}	K_b^2	r_{bc}
r_{ac}	r_{bc}	K_c^2

where $K_a^2 = a_1^2 + a_2^2 + a_3^2 +$ the communality of test A.

summing by columns gives

$$\Sigma r_{am} = a_1 \Sigma m_1 + a_2 \Sigma m_2 + \ldots\ldots$$

$$\Sigma r_{bm} = b_1 \Sigma m_1 + b_2 \Sigma m_2 + \ldots\ldots$$

$$\Sigma r_{cm} = c_1 \Sigma m_1 + c_2 \Sigma m_2 + \ldots\ldots$$

where m represents a,b,c.

and the total sum gives

$$\Sigma r_{mm} = (\Sigma m_1)^2 + (\Sigma m_2)^2 + (\Sigma m_3)^2 + \ldots\ldots$$

If x_1, x_2, x_3 are uncorrelated

$$\Sigma r_{mm} = (\Sigma m_1)^2 \quad \text{for the } x_1 \text{ factor}$$

and $$\Sigma r_{am} = a_1 \Sigma m_1$$

$$\therefore a_1 = \frac{\Sigma r_{am}}{\sqrt{\Sigma r_{mm}}}$$

i.e. the first factor loading for any test is given by

$$\frac{\text{sum of test column}}{\text{square root of total}}$$

as seen by considering r_{bm} , r_{cm} .

The first factor residual is the residual variance and correlation left after the first factor loadings have been calculated, viz

$$\rho_{aa} = K_a^2 - a_1^2 = a_2^2 + a_3^2 + \ldots.$$

$$\rho_{ab} = r_{ab} - a_1 b_1 = a_2 b_2 + a_3 b_3 + \ldots$$

$$\rho_{bc} = r_{bc} - b_1 c_1 = b_2 c_2 + b_3 c_3 + \ldots. \quad \text{etc.}$$

In consequence

$$\Sigma \rho_{am} = \Sigma r_{am} - a_1 \Sigma m_1$$

$$= 0$$

i.e. each column sum of the residual matrix should be zero if the working so far is correct.

The second factor loadings can be extracted by treating the residual matrix in the same fashion.

Thomson[1] points out that , for three tests only, so long as the correlations do not average more than 0.5 they can (usually) be imitated without a general factor, although one can be used if desired. With this borne in mind an attempt was made to find, common to the interest tests, at least one common factor by means of Thurstone's[2] method.

The first step was to arrange the correlation coefficients in order of decreasing magnitude. (Table 9)

The diagonal elements were left blank instead of inserting the correlation coefficient (unity) between each test and itself, and the communalities of the tests had to be introduced into these squares. Before proceeding further it was decided to check to see whether the coefficients themselves justified any attempt to extract more than one factor. The criterion used was that given by Thomson[1], that the coefficients , or the residuals for factors after the first, should not be less than three times the standard error of the correlations. If the coefficients , or residuals , exceed this figure the factor loading will have some significance, if they do not its significance will be open to question, the degree of doubt depending on the discrepancy between the two figures. A residue less than three times the standard error may be attributable to sampling error.

A matrix showing the values of three times the standard error of the correlation was then prepared, Table 10.

[1] Factorial Analysis of Human Ability. G. H. Thomson Page 258

[2] Multiple Factor Analysis. L. L. Thurstone

[3] Thomson , op cit . Page 150

Table 9

Correlation coefficients for interest tests

Test	I v P	A v P	I v A	
I v P	(.535)	.535	.227	
A v P	.535	(.535)	.041	
I v A	.227	.041	(.227)	
	1.297	1.111	.495	2.903

Table 10

3 x (Standard Error)

Test	I v P	A v P	I v A
I v P			
A v P	.159		
I v A	.210	.222	

Comparing Table 9 with Table 10 it was seen that in two instances out of three the coefficients exceeded three times the standard error, thereby justifying to some extent the extraction of a first factor.

Since the true communalities were not known a guess was made at their values by inserting in the diagonal element the highest correlation coefficient in the column concerned.

The column totals , including communalities , were found and also the grand total of the figures in the matrix. These are shown at the foot of the table. The amount of the first factor present in each test was then found by dividing the column total for that test by the square root of the grand total, giving the first factor loading.

Test	First Factor Loading
I v P	.761
A v P	.652
I v A	.291

The reduced correlation matrix was next derived from these first factor loadings by filling each square of the matrix with the product of the first factor loadings of the two tests involved, giving Table 11.

From the original matrix and this reduced matrix the matrix of first factor residuals was obtained (Table 12) by subtracting the numbers in the squares of the reduced matrix from those in the corresponding squares of the original

Table 11

1st. Reduced Matrix

Test	I v P	A v P	I v A
I v P	.580		
A v P	.497	.425	
I v A	.221	.189	.084

Table 12

1st. Factor Residuals

Test	I v P	A v P	- I v A
I v P	(-.045) .038	.038	-.006
A v P	.038	(.110) .148	+.148
- I v A	-.006	+.148	(.143) .148
	.070	.334	.290

.694

matrix, including the communalities.

A check on the working was introduced at this stage. By the nature of the procedure each column total in the matrix of first factor residuals was bound to be zero if the operations had been correctly carried out. Having seen that this condition was satisfied , or sensibly so since the loadings were approximated to three decimal places, the diagonal elements were deleted ready for the insertion of the new communalities for the second factor.

Commenting on Thurstone's method Thomson[1] writes that " the diagonal residues are much the least trustworthy part of the ~~correlations~~ calculations when approximate communalities are used and it is better to delete them at each stage and make a new approximation."

Comparison of Table 10 and Table 12 shows that in each case (three times the standard error) exceeds the corresponding first factor residual. Any second factor loadings obtained therefore must be regarded as being of doubtful significance. Bearing this in mind these loadings were evaluated to see if they did suggest the existence of a possible second factor.

The sum of a column from which a positive diagonal element had been deleted was now negative, since each column sum had been zero before. The next step was to change the sign of the column and row from which the greatest positive

[1] Thomson. op cit. Page 163

element had been removed, in this case the I v A test. Summing all columns again this single change was found to have been sufficient to make all column totals positive, and the new communalities were inserted.

The procedure for finding the first factor loadings was repeated to give the second factor loadings , i.e.

Test	Second Factor Loading
I v P	.084
A v P	.401
I v A	-.348

The second reduced matrix (Table 13) and the second factor residuals (Table 14) were found. Comparing these residuals with the standard error matrix showed that little or nothing would be achieved by trying to extract further factor loadings from these correlation coefficients, since, according to Thomson[1], if the residues were much less than the standard errors further analysis would be illusory.

Suggested Factors

Test	1st. Factor Loading	2nd. Factor Loading
I v P	.761	.084
A v P	.652	.401
I v A	.291	-.348

Since the sums of the squares of the factor loadings for any test should be unity when the factors fully account for the nature and content of the test it will be seen that

[1] Thomson . op cit. Page 165

Table 13

2nd. Reduced Matrix

Test	I v P	A v P	I v A
I v P	.007		
A v P	.034	.161	
I v A	.029	.140	.121

Table 14

2nd. Factor Residuals

Test	- I v P	A v P	- I v A
- I v P	(.031) .035	-.004	+.035
A v P	-.004	(-.013) .008	.008
- I v A	+.035	.008	(.027) .035

the two factors above do not by any means account for the tests. The I v P and A v P tests, however, both have fairly high loadings of the first factor, assuming that such a factor does exist.

Identification of the factor has much in common with solving a crossword puzzle. The clues are present in the values of the correlation coefficients and the nature of each test. As in many crossword puzzles there are many possible alternatives for the answer, in this case the factor, and we can but hazard a guess at the quality which seems best to fit the clues.

The relatively high loadings in the I v P and A v P tests suggest some influence away from the passive interest group, some 'drive' or 'urge to do something', presumably too something requiring intelligent application since the items in both the intellectual and active groups relate to things which could not be done without a fair amount of intelligence and reasoning. The loading in the I v A test implies that this factor is more concerned with mental energy than manual skill. The inference seems to be, then, that the first factor in the interest tests is a 'drive towards purposeful activity'. 'General ability' might also account for the figures. Yet a third possible identity for this factor could be the 'persistence' factor postulated by Alexander[1], who suggested that ' there are few interest categories likely to be ascertained ' and that these are

[1] Alexander. op cit.

likely to be found dependant on the factors of personality, 'of which we believe persistence to be one.'

Turning to the second factor, and not forgetting the statistical doubts about its existence, we find that, if such a factor exists, the evidence is in favour of its being concerned with manual, or athletic, skill or with physical energy. In the A v P test it is loaded towards the active interests to the extent of .4, and in the I v A test it is loaded towards the active interests by an almost equal amount, .35. From its lack of concern with intellectual interests it does not seem to be associated with intelligence. It is, apparently, to be found in the active group of interests only, the most likely qualities being those mentioned above. Little evidence is forthcoming to aid a decision between these two traits, and in view of the doubts about the existence of the factor, there is little point in trying to make such a decision from the information available.

Having attempted, within the limits of the method, to find factors common to the interest tests the procedure was repeated for the six tests together. The matrices, obtained in the manner already described, are given in Tables 15 to 20 .

Table 15

Correlation Matrix

Test	Ability	Otis	VS.10	I v P	I v A	A v P
Ability	(.817)	.817	.725	.476	.376	.226
Otis	.817	(.817)	.647	.464	.393	.258
VS.10	.725	.647	(.725)	.4o8	.345	.262
I v P	.476	.464	.4o8	(.535)	.227	.535
I v A	.376	.393	.345	.227	(.393)	.o41
A v P	.226	.258	.262	.535	.o41	(.535)
	3.437	3.396	3.112	2.645	1.775	1.857
	16.222					

Table 16

3 x (Standard Error)

Test	Ability	Otis	VS.10	I v P	I v A	A v P
Ability						
Otis	.075					
VS.10	.108	.135				
I v P	.171	.177	.189			
I v A	.210	.213	.213	.159		
A v P	.189	.192	.201	.210	.222	

Table 17

1st. Reduced Matrix

Test	Ability	Otis	VS.10	I v P	I v A	A v P
Ability	.729					
Otis	.720	.711				
VS.10	.660	.652	.597			
I v P	.561	.554	.508	.431		
I v A	.376	.372	.341	.290	.194	
A v P	.394	.389	.356	.303	.203	.213

Table 18

1st. Factor Residuals

Test	Ability	Otis	VS.10	- I v P	I v A	- A v P
Ability	(.088) .168	.097	.065	+.085	.000	+.168
Otis VS.10	.097	(.106) .131	-.005	+.090	.021	+.131
VS.10	.065	-.005	(.128) .100	+.100	.004	+.094
- I v P	+.085	+.090	+.100	(.104) .232	+.063	+.232
I v A	.000	.021	.004	+.063	(.199) .162	+.162
- A v P	+.168	+.131	+.094	+.232	+.162	(.322) .232
	.583	.465	.358	.802	.412	1.019

3.639

Table 19

2nd. Reduced Matrix

Test	Ability	Otis	VS.10	I v P	I v A	A v P
Ability	.093					
Otis	.075	.059				
VS.10	.057	.046	.035			
I v P	.129	.103	.079	.177		
I v A	.066	.053	.041	.091	.047	
A v P	.163	.130	.100	.225	.115	.285

Table 20

2nd. Factor Residuals

Test	Ability	Otis	VS.10	I v P	I v A	A v P
Ability	(.075) .066	.022	-.008	+.044	+.066	-.005
Otis	.022	(.072) .051	+.051	+.013	+.032	-.001
-VS.10	-.008	+.051	(.065) .051	+.021	-+.037	-+.006
+-I v P	+.044	+.013	+.021	(.055) .044	-+.028	+.007
-I v A	+.066	+.032	-+.037	-+.028	(.115) .066	+.047
+-A v P	-.005	-.001	-+.006	+.007	+.047	(-.053) .047
	.185	.168	.072	.101	.146	.089
	.761					

In accordance with the criterion that the residuals should exceed three times the standard error the process should have ceased after the extraction of the second factor loadings. The significance of the third factor loadings must therefore be regarded as problemmatical, and there seemed to be little justification for pressing beyond this point. The factor loadings obtained were :-

Test	1st. Factor	2nd. Factor	3rd. Factor
Ability	.854	.306	.212
Otis	.843	.244	.193
V.S.10	.773	.188	-.083
I v P	.657	-.421	.116
I v A	.441	.216	-.167
A v P	.461	-.534	.102

From the first factor loadings in the Otis and Ability tests it seems reasonable to assume that this is the general ability factor known to be common to all such tests. It is worth noticing that the interest tests also contain considerable loadings of this factor.

The negative, and relatively high, loadings for the second factor in the I v P and A v P tests stands out amoung this series. A passive or lazy element is suggested. A positive score in either of these tests implies predominantly non-passive interests. A positive factor loading therefore would mean that the factor was directed away from passive

interests. The negative signs then imply that the factor in this case could be 'passivity' which in turn could be interpreted as 'lack of persistence'. The V.S.10 loading compared with that of the Ability test adds weight to this proposal, since the V.S.10 sets out to measure practical ability as distinct from abstract ability. It seems possible that a'dreamer' might show more abstract than practical ability.

Identification of the third factor is even less conclusive, the loadings being so small that they fail to suggest any marked tendencies. In view of the questionable existence of this factor it hardly seems worth while insisting on an identity for it, although it was perhaps useful to find the loadings in case they had shown more definite tendencies.

Correlation of Interest with Achievement in School Subjects.

As mentioned earlier, it was intended also to try to find what relation, if any, existed between the various interest groups and different types of school subjects. The four subjects in which a conveniently large number of boys had been tested by the same examiners on the same papers were a) French

b) Geography

c) Physics

d) Art

The marks obtained in these four subjects, plus interest scores , are listed in Table 21. Where available copies of the test papers are included in Appendix E.

Before examining the correlations something should be said about the nature of the test papers and the qualities which they may be thought to examine.

The French test was that used by T.S.Percival[1] in his work on standardised achievement tests in that subject. The marks taken were the total marks obtained in the two forms of the grammar test. The test questions consisted of short sentences into which words had to be inserted for completion. It could hardly be regarded as a test of literary appreciation in a foreign language, the qualities most needed for success being persistence, memory and verbal ability.

[1] T.S.Percival. Unpublished M.Ed. Thesis. Durham University

Table 21

Form marks and Interest scores

Grammar School A

A stream

Boy	French	Geog.	Physics	Art	I v A +	I v A -	I v P +	I v P -	A v P +	A v P -
1	49	61	73	3o	41.2			22.2		22.2
2	8o	36	54	35		1o.o		11.1		11.1
3	83	44	72	6o		11.1		2o.o		2o.o
4	4o	49	46	23	28.6		o			29.4
5	49	25	61	27	9.1			15.8		41.2
6	4o	39	62	85		14.3	5.3		7.7	
7	78	44	98	55	o		6.7		o	
8	51	4o	84	65	o			5.9	33.3	
9	35	54	62	38	33.3			15.8	23.1	
1o	4o	44	28	75	33.3			5.9	o	
11	73	61	8o	28	2o.o		36.3		75.o	
12	42	22	38	16	21.1			11.1	1o.o	
13	59	37	48	44	23.1			17.6		38.4
14	51	47	62	49		5.3	5.3		o	
15	74	44	53	21		28.6		16.7	9.1	
16	56	35	68	27		2o.o	4o.o		33.3	
17	79	32	46	72	28.6			78.5		55.5
18	24	54	53	67	25.o		5.3		33.3	
19	63	56	67	53	36.8			12.5	75.o	
2o	76	54	53	85	41.2			25.o		33.3
21	71	6o	68	79	15.8		17.6		16.7	
22	68	35	34	83	12.5			11.1		22.2
23	62	39	6o	39	o			25.o		83.3
24	57	69	55	58	25.o		33.3		45.5	
25	5o	36	51	33	5.9			41.2	6.7	
26	68	34	7o	18	46.7		66.7		77.7	
27	47	54	65	75		26.3	4.8		41.2	
28	77	45	8o	7o	41.2			17.6		33.3

Table 21

Grammar School A

B stream

Boy	French	Geog.	Physics	Art	I v A		I v P		A v P	
					+	-	+	-	+	-
1	28	37	85	84		23.8		20.0	17.7	
2	35	36	52	37	23.1			20.0	28.6	
3	25	28	29	63	0			53.0		5.9
4	37	49	57	26	20.0		60.0		50.0	
5	28	25	59	84	14.3		23.1		20.0	
6	30	50	39	27	0		0		16.7	
7	56	34	54	17		7.7		25.0		28.6
8	15	17	49	79		9.1	38.5		27.2	
9	43	35	22	60	12.5			5.3		23.8
10	25	44	40	21		25.0	12.5		12.5	
11	57	24	52	35	20.0		9.1		5.3	
12	35	24	54	40		9.1		50.0	33.3	
13	37	29	39	45	38.5			15.8		66.7
14	32	49	47	50		11.1	33.3		33.3	
15	53	34	52	21	5.9		0			20.0
16	30	58	52	70		9.1	6.7		23.1	
17	31	19	60	33		16.7		83.4		9.1
18	71	25	67	31		12.5		14.3		28.6
19	15	15	66	16		46.7	0		0	
20	23	47	23	22		33.3		29.4		33.3
21	29	27	44	24	46.7		5.3			20.0
22	40	24	40	90	47.4		10.0			29.4
23	24	30	52	28		20.0	57.2		81.8	
24	47	45	69	66	10.0		16.7		0	
25	14	20	36	54	38.5			37.5		12.5
26	30	31	52	43		17.6	0		0	
27	51	18	29	48	33.3		22.2		7.7	
28	36	26	80	19		20.0	26.3		12.5	
29	25	35	54	49	26.3		17.7		57.1	
30	24	28	84	30		7.7		37.5	16.7	

The principal contents of the Geography paper were a compulsory map question, requiring general and practical ability, and questions on regional geography, involving considerable memory work, especially the ability to memorise facts from reading matter. As with all learning work persistency was involved.

In the Physics paper the questions were divided into two parts, Section A being short questions requiring short factual answers, and Section B being longer questions generally needing essay type answers describing some experimental work. Mathematical questions were not numerous as the examination occurred after only one and a half terms' work in the subject. The test seemed to be loaded in favour of practical sense rather than verbal ability. Persistency too would help to increase the final mark.

The Art test was a painting of a scene from 'memory'. Imagination might presumably be a considerable help if memory failed. Marks were given for the content of the painting and for the skill with which it was executed.

Scattergrams were plotted showing marks in each subject against each interest score, as for the previous correlations. A summary of the correlation coefficients obtained is given on Table 22. The figures in brackets under the coefficients are the standard errors of the correlations.

Table 22

Correlations with School subjects

	I v A	I v P	A v P
French	.175 (.127)	-.026 (.131)	-.181 (.127)
Geog.	.153 (.128)	.161 (.128)	.211 (.125)
Physics	-.257 (.123)	.090 (.130)	.227 (.125)
Art	.300 (.119)	-.011 (.131)	-.117 (.130)

The first outstanding feature of Table 22 is that the standard errors are relatively high, as they are bound to be with only fifty eight boys in the sample. Definite deductions cannot be made from the results therefore, but they do at least hint at certain possibilities. In this reserved and critical spirit the following suggestions are offered.

It is perhaps more convenient to comment on the results subject by subject than test by test.

French. The correlations are very small throughout but show, if anything, a tendency away from active and practical interests. Both the intellectual and the passive group score at the expense of the other, due possibly to the 'memory' element in the French test. Perhaps the more active type of boy is inclined to neglect the static learning processes necessary to commit the grammatical points to memory. The correlation with the I v P test is too small to justify even a suggestion.

Art. This subject shows figures very similar to French, which at first sight is hardly to be expected. The 'memory' element in the test however may be the key to the results. The more active boys are so concerned with getting on with the job that they have not the time necessary to assimilate impressions. The higher correlation with intellectual than with passive interests may be due to the nature study elements in the intellectual group, together

with such topics as stamp collecting ,(which could encourage a study of pictures and design), chess and card games,(which, to some extent, require memory)

Geography. The correlations with the tests involving passive interests show tendencies which might be expected. The questions on the geography paper included a large practical element, favouring the active interests, plus a leaning towards book learning which might be expected in those with more intellectual interests.

Physics. Very gratifyingly this subject shows a marked correlation with active and practical interests. Being the basis of nearly all forms of practical hobby, and, recognised or otherwise by the boys, supplying the principles of all movements or actions in sports, it is reasonable to expect those most interested in these things to tend to do well in the subject itself.

SELECTED CASE STUDIES.

Selected Case Studies.

The low correlations of the interest tests with ability and achievement lead one to conclude that case studies from a random sample of the boys taking the tests could furnish little or no evidence in support of the other results. It was decided therefore to restrict the studies to those boys having interest scores of more than 50% in any direction and to see if these large interest measures were in accordance with what was known of the boy's interests and habits from other sources, thus affording some idea of how well our tests measured interests.

The pattern for the case studies was that used by previous workers in America.

Anticipating the results of the enquiries it can be said that, with few exceptions, boys whose interest score in any direction exceeded 50% were found to have some outstanding trait which, on the basis of the hypothesis, might be expected to produce an interest in that particular direction.

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(1) Educational Psychology. Gates, Jersild, McConnell, Challman. Page 735. Macmillan Co. New York.

The material of the case studies was collected from a variety of sources. No formal interviews were conducted, such information as was collected from the boys themselves being obtained during informal talks. In those cases from the writer's own school much was learned by personal observation and a similar fund of information was provided by the Headmaster of the other school concerned. Other sources of evidence were fellow members of staff and, in a few cases, people unconnected with the schools who knew the home life of the boy in question.

It was felt that this indirect approach would give a more nearly true picture than the one to be obtain by direct questionning, a procedure which might easily arouse the suspicions and produce a false response.

Case 1.

Boy No. 11, Grammar School A, A stream.

Always in the first three in form. Uniformly good in all subjects except Art, in which he is near the bottom.

I.Q. 136.

Home Background. Mother a teacher before marriage.

One older sister who has just graduated in Physics at Cambridge. The boy's ambition is to do at least as well.

Health, Disposition.

Although normally pale there have been no reasons to suspect chronic ill-health.

Well developed and in good proportions.

Quiet and serious disposition, but with quite a keen sense of humour. Generally popular among his form.

Hobbies,

Outdoor. Whilst not an outstanding athlete he is a keen performer during organised games periods both at Rugby and at Cricket. Not on any school team.

Not a regular supporter of any club other than school teams.

Member of the School Scout Troop.

Model aeroplane enthusiast.

Indoor. Stated on more than one occasion that he never reads comics.

Regular attender at meetings of the Chess club, Science Society and History Society.

Very fond of books, including those with scientific topics. Has a remarkably accurate idea of the Rutherford-Bohr atom, and of the working of the atomic bomb.

Radio. Rarely listens to variety, occasionally to plays and talks.

Pictures. Selected films only, e.g. Hamlet, and the film of the Olympic Games.

Outstanding Interest Score.

A v P 75

Comments. Home background seems to account for the interest in things mechanical and scientific, and perhaps also for the lack of interest in the passive group. High intelligence would help in the successful development of the active interest items.

Case 2.

Boy No. 17, Grammar School A, A stream

Although a year below the average age of the form he is always about fifth in the form order. Good in most subjects but particularly so in Languages and in Art. Weakest subject, Geography.

I.Q. 123

Home Background.

Father a teacher in secondary commercial school, taking mainly P.T. and English.

One younger brother, about seven years, who is in constant attendance during the holidays etc.

The father's wish, unknown to the boy, was for him to graduate in Science and try for a post in industry. The boy, however, now studies Classics.

Health, Disposition.

Well built, about average height.

Normally healthy.

Quiet and serious disposition. Shy, but with a keen sense of humour. Popular in his form despite the age difference.

Hobbies.

Outdoor. Holds a place on the School Under 14 teams for Rugby and Cricket although he is still eligible for the Under 13 teams.

If no school matches are available he is fond of football and watches local club games.

Member of the Cadet Force.

Indoor. Reads widely, including comics, some of which come from his younger brother. Takes 'Wizard' regularly and exchanges with other boys.

Radio - Dick Barton, otherwise his listening is largely confined to that heard between boutsof homework, which is never neglected.

Pictures - normal attendance, once per week. No marked preference but a slight bias towards thrillers.

Member of the Art Society.

Fond of doing fretwork.

Outstanding Interest Score.

I v P -78

A v P -55

Comments.

This is a case where the interest scores in the tests differ from what might be expected from the boy's ability and athletic keeness. Immaturity may be a part cause of this, but on the other hand the observed correlations mean that there are bound to be instances of this type.

Case 3.

Boy No. 19, Grammar School A, A stream.

Sound all round in form subjects, finishing usually in the top half of the form.

I.Q. 120

Home Background.

Father a civil servant.

One older brother, also in the school and one year ahead. This older boy is very keen on scientific subjects, to the detriment of some of his others, and is an inveterate dabbler in things mechanical and electrical. He is also a very keen scout.

Health, Disposition.

Below average size.

Normally healthy although rather pale.

Very quiet and retiring.

One of a small group of non-athletes in an otherwise athletic form.

Hobbies.

Outdoor. Not fond of organised games but makes no attempt to dodge them. His retiring nature prevents him from putting much effort into them.

Fond of cycling, with other members of the non-athletic group.

Interested in model aeroplanes and railways.

School Scout Troop.

School Cadet Force..

Indoor. Reads widely, including comics, but mostly concerned with mechanical and electrical gadgets. Takes the Meccano magazine.

Regular attender at meetings of the Science Society and of the Chess Club.

Radio - rarely listens, his spare time being spent to a large extent on making models.

Pictures - occasionally, with no particular preference.

Outstanding Interest Score.

A v P 75

Comment. The interest score here is not unexpected. The boy's own general ability, together with the influence of his elder brother, could well foster interest in the items of the active interest group.

Case 4.

Boy No. 23, Grammar School A, A stream.

Usually in the lower half of the form.

Best subjects :- English, History, Latin, French

Worst subjects :- Maths, Science, Art, Geography.

I.Q. 132

Home Background.

Father in shipping office.

One younger sister, rarely in evidence.

Health. Disposition.

Very tall and well developed.

After earlier absences he now seems to be very stromg and healthy.

Rather self-conscious, as though his abnormal height attracts attention, but very pleasant when he feels at ease.

Among his own age-group - a 'lady-killer'.

Hobbies.

Outdoor. Good athlete, relying on size rather than on skill.

School Under 14 XV

440 yards champion for his age.

Reasonably good swimmer, but no good at cricket.

School Cadet Force.

When not playing games he is usually watching

them, accompanied by a group of girl friends.

Indoor. Member of the Drama Society.

Takes Wizard, and exchanges for other comics.

Produces a form news-sheet, an unofficial organ dealing largely with the activities of members of the girl's school.

Radio - Charlie Chester, Much Binding in the Marsh and similar programmes , superimposed on homework.

Pictures - about twice a week, with female escort.

Regular attender at school dances.

Outstanding Interest Score.

A v P -83

Comment.

The form subjects reveal a lack of practical ability which, coupled with a premature sophistication, goes a long way towards accounting for the interest score.

Case 5.

Boy No. 26, Grammar School A, A stream.

Normally in the first three in form.

Uniformly good in all subjects except Art in which he is next to the bottom.

Particularly strong in Latin.

I.Q. 119.

Home Background.

Member of a family of orthodox Jews, the father being a jeweller by profession.

One sister about a year younger.

The parents are particularly anxious for the boy to do well, not just in form subjects, but in all aspects of school life.

Health. Disposition.

Small but sturdily built.

Suffers from appallingly bad eyesight. Even with very powerful spectacles he can only see the blackboard from the front desks. Without his glasses he is almost blind.

In spite of this he is always cheerful and has the most charming manners.

Popular in the form, and in the school generally.

Hobbies.

Outdoor. His eyesight prevents him from becoming

proficient at games, but he never misses organised games even though a rugby ball often hits him because he is unable to see it coming.

Regular attender at school matches, especially those in which his friends are playing.

Fond of cycling.

School Cadet Force.

Indoor. Reads widely, despite his eyesight.

Does not take a regular comic, but sometimes reads other peoples' copies.

Meccano, model railways, stamps.

Regular attender at meetings of the Science Society, History Society and Chess Club.

Invariably stays behind after Physics to ask how something ' works '.

Attended most of the lectures and many of the visits of the British Association in Newcastle in 1949.

Radio - rarely listens.

Pictures - eyesight does not permit .

Outstanding Interest Score.

I v P 51

A v P 82

Comments. Here the interest scores from the tests are in agreement with the observations, both being explained by the studious nature of the boy and the attitude of the parents. His opportunities to develop passive interests are very limited.

Case 6

Boy No. 4, Grammar School A, B stream.

Usually in the first three, with good marks in all subjects other than English Literature and Art.

I.Q. 115.

Home Background.

Father a solicitor Not often seen at school on open days when parents normally attend.

One younger brother.

Health. Disposition.

Very tall and strongly built. He has a slight impediment in his speech , due to the protusion of the upper front teeth.

Self-conscious and truculent, perhaps on account of his stature.

Tends to avoid the more active members of the form, but seems popular in his own circle, most of whom are those who travel to and from school with him.

Hobbies.

Outdoor. Takes as small a part as possible in organised games , or any other games for that matter.

Does not support school teams or any outside clubs.

One of the few in his form who is not a member of either scouts or cadets.

Indoor. Reads fairly widely, mainly adventure

stories.

Does not take a regular comic.

Collects stamps.

Attends meetings of the Science Society and the Chess Club.

Member of the School Orchestra.

Radio - rarely listens, most of his time being spent on laborious but conscientious homework.

Pictures - occasionally, without any particular preference regarding the nature of the film.

Outstanding Interest score.

I v P 60

Comment. It is felt that the interest score in this case is essentially relative. His truculence and lack of enthusiasm for the usual schoolboy interests are the outstanding features. At the same time his mental powers are not outstanding, suggesting that the score of 60% is due more to absence of passive interests than to possession of intellectual interests. As a whole this example is far from conclusive.

Case 7.

Boy No. 13, Grammar School A, B stream.

Well down towards the bottom of the form.

Weak in most subjects, although he has a fairly high mark in Latin - due probably to having been kept down a year and so having covered the ground before.

I.Q. 96.

Home Background.

Only child of parents who let him have everything that he wishes. The boy uses his mother's dotings to obtain notes to excuse him from anything at school which he thinks he might not like.

Health. Disposition.

Average height and well built.

Alleged to suffer from rheumatism, but, in the absence of any medical certificate, the staff are inclined to be sceptical. The complaint is apt to occur at strangely convenient intervals,

Fitful and moody. Often works cheerfully and well, but at other times he is completely uninterested.

His relations with the rest of his form seem to be on the same footing.

Hobbies.

Outdoor. A good athlete who has played for the Under 14 teams at Rugby and Cricket. At times he plays

hard and obviously enjoys it, at others he will dodge playing for no apparent reason. The decision seems to depend largely on whether or not his mother thinks it is too wet.

Fairly good swimmer.

School scout troop.

Indoor. Seems to spend all his time either in, or preparing for, 'Gang Shows'. Despite his low position, and persistent requests from the school to limit the time spent in this way, his parents continue to let him sap his energy by hours spent at rehearsals, often late at night. His rheumatism never seems to occur at these times, despite late hours and draughty stage accommodation.

Attends school dances whenever possible.

Outstanding Interest Score.

A v P -67

Comment. His connection with the 'Gang Shows' seems to be the source of his knowledge of many of the items in the passive interest group, even though his interest in the theatre is very far from passive.

Case 8.

Boy 17, Grammar School A, B stream.

Just above half way up the form list.

Best subjects :- Latin, Physics, Chemistry.

Worst subjects :- Geography, History.

I.Q. 117.

Home background.

Father a schoolteacher.

No brothers or sisters.

Health. Disposition.

Rather above average in height, but rather frail and stoops noticeably

Often troubled by bronchial complaints.

Slight 'hare' lip.

Very shy and diffident. Lack of self-confidence makes him seem truculent to prefects and staff but he is generally popular among his own age group.

Hobbies.

Outdoor.

Fairly good athlete when he forgets his shyness.

Has played for the School Under 14 XV.

Good swimmer.

Fond of cycling.

Member of school cadet corps.

~~Indoor~~

Indoor. Reads a good deal form the school library.

Takes 'Adventure' and exchanges with others.

Fond of mechanical gadgets, miniature diesel engines etc. and has tried to make a wireless set.

Attends meetings of the Science Society.

Radio - listens to programmes whilst trying to do homework.

Pictures - once per week.

Outstanding Interest score.

I v P -83

Comment.

This is another indefinite case where there is little in the case study to lead one to expect such a large score in the passive interest group. With the low correlations obtained such instances are bound to exist.

Case 9.

Boy No. 23. Grammar School A, B stream.

About fifth in the form.

Weakest in French and Latin, otherwise generally sound.

I.Q. 114.

Home Background.

Father is an electrical engineer.

One older brother, also in the school, who is very keen on science topics. Both have spent much time on stage wiring and similar jobs.

Health. Disposition.

Wiry and tough, although not above average in stature.

Very few lengthy absences.

Goes out of his way to look for jobs to do which require the use of mechanical or electrical tools or fittings.

Equally devoted to Rugby.

A 'woman hater'.

One of the most respected boys in the whole school, by staff and boys alike.

Hobbies.

Outdoor. To him nothing compares with Rugby. If he is not playing it, he will be watching it.

Played for Northumberland Schoolboys Under 15 XV.

Keen on long distance running in the summer , to get fit for the next Rugby season.

Studies natural history quite seriously and successfully.

Indoor.

Reads technical books and magazines, probably acquired from his brother.

In conjunction with his brother he has made,or tried to make,several wireless sets, model electric motors and the like.

A mainstay of the Science Society.

Radio - rarely hears it.

Pictures - attends very infrequently, and then it is usually to see films with some technical interest.

Leading member of the school orchestra.

Outstanding Interest Score.

I v P 51

A v P 82

Comments.

The interest scores here are in accordance with expectations. The time spent on music and natural history, in the intellectual group, and on sport and practical work, in the active group, leave little room for passive interests.

Case 10.

Boy No. 19. Modern School, 1st. stream.

Usually just below half way down a form containing many'near misses'from free place examinations.

Painstaking but not quick-thinking.

Best subject - English

Worst subject - Mathematics.

I.Q. 110.

Home background.

The boy's father is a shipyard welder.

One younger brother and one older sister.

Parents have no particular ambitions for the boy apart from a slight preference for a clerical job.

Health. Disposition.

Height and build above average for age.

No prolonged absences or chronic complaints.

Quiet disposition , rather lacking in self-confidence.

One of a small group of quiet boys within a fairly active form.

Hobbies.

Outdoor. Takes part in organised games but without any great show of enthusiasm.

Prefers Soccer to Rugby, but is not on any representative team for either game.

Fairly good swimmer.

Member of scout troop connected with his church.

Indoor. Being a member of the local library he reads a good deal, usually adventure stories.

Takes 'Hotspur' each week and his brother takes 'Adventure'.

Radio - listens to serial thrillers and to some variety programmes.

Pictures - usually once per week, showing no special preference for any one type of film.

Active member of the School Art Society.

Outstanding Interest Score.

A v P -60

Comments.

Although there is evidence of opportunity to develope passive interests it is not clear why they should be so much stronger than the active interests, unless the parental preference for a clerical job is accompanied by a refusal to encourage active pastimes in the home.

Case 11.

Boy No. 30. Modern School, 1st. stream.

Below half way down the form list.

Fairly good at Maths and Science but otherwise generally weak.

I.Q. 96.

Home Background.

Father killed during the war, mother is now doing domestic work.

Elder brother working in soap works.

The attitude of the family is that thesooner he gets a job the better it will be for all.

Health. Disposition.

Tall, rawboned boy, very strong for his age and with a tendency towards bullying.

Often absent but usually for domestic reasons rather than ill-health.

Noisy but not ill-natured.

His attitude towards school life varies from one memoer of staff to another. He has scant respect for obviously non-athletic types.

Hobbies.

Outdoor. Fond of any vigourous sport, and is a member of the school soccer XI.

Good also at boxing and swimming.

A would-be fast bowler, but otherwise not very good at cricket.

Member of a junior football club outside the school.

Indoor.

Spends very little time in the house.

Radio - usually listens to 'Dick Barton' but very little else.

Pictures - goes two or even three times each week with a gang of other regulars of about the same age, or perhaps a little older.

Outstanding Interest Score.

I v P -100.

A v P -50.

Comments.

This case runs true to expectations.

When not engaged in sport his time is largely spent in picture houses or in loafing, a suitable condition for acquiring passive interests. Intellectual interests and chances of developing them are practically nil.. These facts are reflected in the test scores.

Case 12.

Boy No. 32. Modern School. 1st. stream.

Near the bottom of the form, being generally weak in all subjects but relatively better in Maths, Science and Manualwork.

I.Q. 100.

Home Background.

The only child in the family, his father being a plumber. The parents will be content if the boy also becomes a plumber.

Health. Disposition.

Average height and thickly built.

His only lengthy absence from school was for a broken leg caused by a fall when climbing a tree.

Determined and pugnacious at times , though usually quiet.

Tends to keep to himself and is not easily led by the popular mood of the form.

Hobbies.

Outdoor.

Fair performer at most games, being a member of the school Rugby XV.

Also useful at swimming and boxing.

Member of the Sea Scouts.

Indoor.

Spends much of his time with his father in a workshop attached to the house. Assists his father during the holidays.

Reads the 'Wizard' but does not generally spend much time reading.

Radio - barely interested

Pictures - not a regular attender although he sometimes goes to see thrillers.

Outstanding Interest Score.

I v A -50

A v P 50

Comments.

This result is in agreement with the test scores and with the hypothesis. There is little ability or encouragement to foster intellectual interests, whereas both of these are forthcoming for practical interests.

Passive interests, whilst not altogether denied, do not receive very much time or attention.

Case 13.

Boy No. 2, Modern School, 2nd. stream.

Rather more than half way up the form list.

Best subjects :- Maths , Science, Manual Work.

I.Q. 103

Home Background.

Father keeps a newsagents shop.

There is one younger sister.

The boy will probably take some minor clerical job and eventually go into his father's business.

Health. Disposition.

Average height, slightly built and often absent for colds and similar minor ailments. It is suspected that his mother tends to soften him.

In school the boy has a tendency to play games usually associated with rather younger boys.

Rather childish, and looked upon by the more active boys as a 'sissy'.

Hobbies.

Outdoor.

Has few, if any, interests of this nature, tending to dodge organised games as often as possible.

Occasionally goes cycling.

Indoor.

Model railway enthusiast.

Having all the comics in his father's shop to

choose from he reads that type of literature extensively.

Radio - occasionally listens to variety programmes.

Pictures - as a member of a cinema club he attends regular weekly matinees.

Outstanding Interest Score.

I v P -62

A v P -57

Comments.

The interest scores are fully confirmed by the case study.

Case 14

Boy No. 25, Modern School, 2nd. stream.

Bottom of the form , being uniformly weak in all subjects,

I.Q. 106.

Home Background.

The boy is an orphan living with his grand parents and an aunt, all of whom are very concerned for his welfare.

Health. Disposition.

About average size.

Pale and often absent for minor ailments but has not, in recent years at any rate, suffered any serious illness.

Very quiet and shy.

Does not mix very much with the other members of the form.

Hobbies.

Outdoor.

Makes no attempt to dodge organised games but he is not a very good performer.

Chief athletic amusement seems to be swimming which he does regularly during the summer.

As a poor mixer he does not spend very much time

out of doors except on shopping excursions with his aunt.

Indoors.

Member of the church choir.

Takes no regular comic but is allowed to buy one if he so wishes..

Radio - is not used very much in the house.

Pictures - his somewhat infrequent visits are usually in the company of his aunt.

Fond of drawing, painting and fretwork.

Outstanding Interest Score.

I v A 71.

Comment.

Despite the lack of athletic inclination and opportunity it is not easy to reconcile the boy's lack of general ability, as shown by the I.Q. and form position, with the high score in intellectual interests.

Case 15.

Boy No. 6, Modern School, 3rd. stream.

In the first five but the general standard of the form is very low,

Top in Art, a purely relative performance.

I.Q. 93.

Home Background.

Father is a builder's labourer.

The boy is the fourth of a family of six, five of whom are under 21 and living at home.

The parents tend to wish that the boy could leave school and earn some money.

Health. Disposition.

Slightly taller than average, tough and well-developed.

Wild and irresponsible although not vicious.

Has many satellites, if only on account of his physical prowess.

Hobbies.

Outdoor.

A robust , if not skilful, performer on the football field, and a strong swimmer.

Boxing champion for his age group.

Tends to associate with a group of youths older than himself, going to billiard saloons, dog racing

and similar amusements.

Indoor.

Not fond of reading, there being very little opportunity for it in the house.

Radio - the family listens mainly to variety and dance music.

Pictures - usually goes once or twice per week with the older boys.

Outstanding Interest Score.

I v A -67

I v P -82

A v P -82

Comments.

Again a premature attempt at sophistication is associated with high scores in the passive direction. The lack of general ability also confirms the test score, the case as a whole being in line with the hypothesis.

Case 16.

Boy No. 16, Modern School, 3rd. stream.

Near the bottom of a poor form.

Weak in all subjects, although relatively good in Manual work.

I.Q. 100.

Home Background.

Father is a joiner and cabinet maker.

There is an elder brother, also a joiner, and the father expects both boys to follow into the business.

Health. Disposition.

Average size and build.

Generally in good health, with no prolonged absences from school.

Happy though irresponsible disposition.

Popular in the school by virtue of being a natural athlete.

Hobbies.

___ Outdoor.

Enjoys all forms of ball games and has a natural eye for them.

Plays for the school at soccer and cricket.

Fond of swimming

Member of scout troop at church.

Indoor.

Too active to be indoors very much.

Takes the 'Wizard' weekly, prefering the stories about sport and adventure.

Radio - usually hears 'Dick Barton' but has no other regular listening periods.

Pictures - averages one attendance per week.

Outstanding Interest Score

I v A -55

A v P +55

Comments.

Lack of general ability and the low form position support the I v A score; on the other hand there seem to be plenty of opportunities for acquiring passive interests and the reason for the score in the A v P test is not so obvious. The home circumstances and natural athletic ability, nevertheless, do offer grounds for expecting a large measure of active interests.

SUMMARY OF EVIDENCE.

Summary of Evidence

The prime object of the research was to produce

a) a comparative study of leisure time interests among grammar school and secondary modern school pupils, and

b) to correlate these interests with specific abilities and achievements.

The results show that there is a marked change in interests as we pass from the grammar school population to that of the secondary modern school. Scores in the Intellectual versus Active interest test move towards the Active pole as ability falls , and in both the Intellectual versus Passive interest test and the Active versus Passive interest test the scores move towards the Passive pole with the lowering of ability. Consideration of the means and standard deviations of the distributions show these differences to be significant.

Alongside the change of interest with ability there is evidence of a change of interest with environment. A rural population gives signs of a greater measure of active and practical interests than that of its urban counterpart. Differences of vocational interests between various groups have previously been shown to exist. Our result seems to be an extension of the same process of interest growth to leisure time interests and is in accordance with the psychological theory of interest. The differences are not

great but they do suggest a fruitful line for further enquiry when, perhaps, home background could be used to classify the environmental groups.

The results in general suggest that the passive interest items are, to a very large extent , common to the whole population.

Correlating the interest scores with the ability scores we find that all the ability tests correlate positively with all the interest tests, and that the degree of correlation in every case is small. This was suggested in the hypothesis from a consideration of the results of earlier workers in similar, although not identical, fields.

The extent to which the experimental evidence bears out the original hypothesis can best be seen by comparing the anticipated results with those actually observed.

a) with Ability tests

1. Intellectual versus Active interests

Anticipated Small but positive correlations with I.Q. and general ability, and to a still smaller degree with practical ability.

Observed Positive correlation coefficients (about .35) with all ability tests, the lowest being with V.S.10, the practical ability test.

2. Intellectual versus Passive interests.

Anticipated Small postive correlations with all types of ability test.

Observed Positive correlation coefficients (about .45) with all ability tests, the lowest again being with V.S.10.

3. Active versus Passive interests.

Anticipated Small positive correlations with ability tests, the largest value being with practical ability.

Observed Positive correlation coefficients (about .25) with all ability tests, the largest (.262) being with V.S.10.

The observations therefore are in agreement with the anticipated results and bear out the original hypothesis that intellectual interests are dependant on the possession of general ability, and that, similarly, active and practical interests are dependant on general plus practical ability. Lack of ability results in a preponderance of passive interests.

b) with achievement in School Subjects, bearing in mind that small numbers make the results of doubtful significance.

1. Intellectual versus Active interests.

Anticipated Small positive correlations with academic subjects, i.e. French, Geography. Small negative correlation with Physics. The correlation with Art was felt

to be ambiguous.

Observed Positive correlations (about .16) with French and Geography. Negative correlation (-.26) with Physics. With Art a positive value (.3) was obtained and was explained as being due to the memory content of the Art examination.

2. Intellectual versus Passive interests.

Anticipated Small positive correlations with all subjects, except possibly Art.

Observed Positive correlation (.16) with Geography. With the other three subjects there was little or no correlation.

3. Active versus Passive interests.

Anticipated Small positive correlations with all subjects, except possibly Art.

Observed Positive correlations (about .2) with Geography and Physics, both of these subjects having a large practical element. Negative correlation (about .15) with French and Art, accounted for by a possible tendency on the part of more active pupils ti hurry the assimilation period needed when trying to memorise things.

These results, though far from conclusive, again show a general agreement between the anticipations and the observations, offering therefore a limited measure of support for the hypothesis.

The selected case studies, undertaken only in those instances where some particular interest measure exceeded 50%, usually revealed that the high interest score could be related to some definite characteristic of the boy concerned. Subject to their own limitations the studies generally showed agreement with the hypothesis.

From the study of the results of previous work in the field of interest testing it was not anticipated that the present tests would yield results which could be used for prediction in individual cases. On the whole the correlations between interests and abilities turned out to be of the order expected, and, whilst clearly showing certain general trends, they could not be used for individual prediction.

Other results arising from the enquiry are

a) the reliability of this type of interest test, and

b) the possibility of Alexander's 'persistence' factor being measured, in part, by the interest tests, particularly those involving passive interests.

The reliability coefficients for the three interest tests were found to be

I vA	.44	
I v P	.60	
A v P	.67	measured by the split-half technique.

With only four subtests in each half a high degree of reliability

was not to be expected, although it is of interest to note that Angus obtained a somewhat similar value (.77) for the vocabulary type of test, using a different method of estimating the reliability. It is reasonable to expect that a longer test, such as that used by Angus[1], would have a greater reliability. Workers with interest inventories (Garretson, Cowdery, Strong etc.) report higher figures, (.9 or over), but they have the advantage of much longer tests to improve their figures. The vocabulary test shows an improvement in reliability over teacher's returns for which Kelley[2] reports a coefficient of .31 .

We have seen also the possibility of a factor in I v P and A v P tests of interest which could be closely linked with the persistence factor suggested by Alexander[3]. Other interpretations are possible, but it does seem as though a more far-reaching enquiry to try to identify this factor should be made.

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[1] Angus. op cit.

[2] Kelley. op cit.

[3] Alexander. op cit.

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APPENDIX A

Lists of words comprising each Interest Group

Appendix A

Meaning of Words Test — Validation List

Intellectual Group

Philatelyst	Grand slam	Swallow
Perforation gauge	Rubber	Bat
Watermark	Revoking	Solo
Stanley Gibbons	Ace	Acrostic
Mounts	Jack	Ash
Penny Black	Conifer	Drone
Blue Mauritius	Crustacean	Solitaire
Roulette	Warren	Red Campion
Rook or Castle	Rookery	Wagtail
Pawn	Limpet	Bishop's pawn
Deadly nightshade	Castling	Beech
Double-blank	Briar	Checkmate
Arpeggio	Gambit	Wolfnote
Check	Andante	Stalemate
Sir Adrian Boult	Draughts	Sir Thomas Beecham
Trump suit	Lexicon	Dummy hand
Monopoly	Trick	Crossword puzzle
Misere	Anagram	Abundance
Ling		

Active Group

Negative
Hypo
Spool
Brief time
Stop number
Developer
Rawlplug
Bradawl
Plane iron
Sweated joint
Shooting board
Vice
Tang
Spokeshave
Bevel
Oilstone
Hacksaw
Annealing
Priming paint
Size
Flex
Tap washer
Stop-cock
Fuse box

Inner tube
Hub
Bowden cable
Cotter pin
Jib
Jib-boom
Fuselage
Biplane
Dihedral angle
Variable condenser
Stroboscope
Tone arm
Valve holder
Projection lens
Draw hoe
Compost
Perennial
Jesse Owens
Bergan
Corner kick
Pass
Foul throw
Off-side
Fair charge

Hands
Knock-on
Try
Lock
Touch
Tackle
Place kick
Bail
No-ball
Square-leg
Point
Crawl
No-jump
Float
Artificial respiration
Rowlock
Pentathlon
Field event
Guy rope
Ground sheet
Alan Patterson
Cathie Gibson
Sydney Wooderson
Maureen Gardner

Passive Group

Arthur Lucan
Stewart Macpherson
Mr. Muddlecombe
Snowey White
Ted Heath
Edmundo Ros
Reginald Dixon
Sam Costa
Mr. Blake, the sexton
Dudley Davenport
Anne Shelton
Ethel 'Igginbottom
Dr. Oliver Dither
Lord Waterlog
The Honourable Phoebe
Wetherby Wet
Mr. Keen
Miss Hotchkiss
Colonel Chinstrap
Sophie Tuckshop
Mona Lott
Frisby
Whippet Quick
Hambone Repertory Co.
Star

Mr. Burp
Horace Hotplate
Sam Spadger
Phil Mason
Lipstone College
Sexton Blake
Tinker
Jimmy Topper
Korky
Danny Longlegs
Barry Steel
The Iron Teacher
Jackie Drake
St. Alfric's
Nick Smith
Morgyn the Mighty
Rip Magee
Dicky Bumblebee
The Falcon
Zachary Scott
Danny Kaye
Alan Ladd
Gregory Peck
David Niven

John Mills
Gary Cooper
Cary Grant
James Mason
Stewart Grainger
Jane Russell
Margaret Lockwood
James Gagney
Orson Welles
Peter Lorre
Humphrey Bogart
Ralph Richardson
Barry Fitzgerald
'A' film
'U' film
Trailer
Oscar
Academy Award
M.G.M.
J.Arthur Rank
Stalls
Box office
Foyer
Attendant

APPENDIX B

The Validation Tests

AME ..... AGE .....

ORM .....

.....

Look carefully at the following words and write what you know about ach word in the space provided. You may make a drawing or sketch herever you think it will help to make your answer clear.

. Bishop's pawn .....

. The Iron Teacher .....

. Valve holder .....

. Wagtail .....

Compost .....

Trailer .....

Arpeggio .....

Vice .....

Mr. Keen .....

. No-jump .....

. St. Alfrics .....

. Bevel .....

'U' film .....

Point .....

Tang .....

Anne Shelton .....

Float .....

Ralph Richardson .....

Monopoly .....

Pass .....

Danny Kaye .....

Acrostic .....

23. Lock .....

24. James Mason .....

25. Alan Patterson .....

26. Box Office .....

27. Jack .....

28. Ash .....

29. Ted Heath .....

30. Lipstone College .....

31. Stalls .....

32. Stewart Grainger .....

33. Stop number .....

34. Jib .....

35. Touch .....

36. Mounts .....

37. Drone .....

38. Developer .....

39. Tackle .....

40. Edmundo Ros .....

41. Conifer .....

42. Sexton Blake .....

43. Jib-boom .....

44. Penny black .....

45. Jane Russell .....

46. Sweated joint .....

47. Double blank .....

48. Ethel Igginbottom .....

49. Tone arm .....

50. Biplane .....

NAME ..... AGE .....

FORM .....

Look carefully at the following words and write what you know about each word in the space provided. You may make a drawing or sketch wherever you think it will help to make your answer clear.

1. Guy rope .....
2. M.G.M. .....
3. The Falcon .....
4. Crustacean .....
5. Place kick .....
6. Margaret Lockwood .....
7. Tinker .....
8. Solitaire .....
9. Blue Mauritius .....
10. Reginald Dixon .....
11. Fuselage .....
12. Roulette .....
13. Warren .....
14. Rawlplug .....
15. James Cagney .....
16. Bail .....
17. Bradawl .....
18. Red Campion .....
19. Jimmy Topper .....
20. Sam Costa .....
21. Deadly nightshade .....
22. Pawn .....
23. 'A' film .....
24. Square leg .....
25. Danny Longlegs .....
26. Variable condenser .....
27. Gambit .....
28. Dr. Oliver Dither .....
29. Artificial respiration .....
30. Wolf Note .....

31. Draw Loe .....

32. Morgyn the Mighty .....

33. Hacksaw .....

34. Pentathlon .....

35. Wetherby Wet .....

36. Oscar .....

37. Rook or Castle .....

38. Plane Iron .....

39. Mr. Blake, the sexton .....

40. Limpet .....

41. Stroboscope .....

42. Korky .....

43. Beech .....

44. Crawl .....

45. Humphrey Bogart .....

46. Jesse Owens .....

47. Annealing .....

48. Checkmate .....

49. Lord Waterlog .....

50. Rowlock .....

B4

NAME ..... AGE .....

FORM .....

Look carefully at the following words and write what you know about each word in the space provided. You may make a drawing or sketch wherever you think it will help to make your answer clear.

1. Philatelist .....
2. Negative .....
3. Arthur Lucan .....
4. Abundance .....
5. Fuse Box .....
6. Hambone Repertory Company .....
7. Grand slam .....
8. Inner tube .....
9. Mr. Burp .....
10. Ling .....
11. Fair charge .....
12. David Niven .....
13. Swallow .....
14. Hands .....
15. John Mills .....
16. Maureen Gardner .....
17. Star .....
18. Perforation Gauge .....
19. Hypo .....
20. Stewart Macpherson .....
21. Misère .....
22. Stop cock .....
23. Whippet Quick .....
24. Rubber .....
25. Hub .....
26. Horace Hotplate .....
27. Anagram .....
28. Off-side .....
29. Gregory Peck .....
30. Bat. .....

31. Knock-on .....

32. Gary Cooper .....

33. Sydney Woodersom .....

34. Attendant .....

35. Watorrark .....

36. Spool .....

37. Mr. Muddlecombe .....

38. Trick .....

39. Tap Washer .....

40. Frisby .....

41. Revoking .....

42. Bowden Cable .....

43. Sam Spadger .....

44. Crossword Puzzle .....

45. Foul throw .....

46. Alan Ladd .....

47. Solo .....

48. Try .....

49. Cary Grant .....

50. Cathie Gibson .....

B5

NAME ..... AGE .....

FORM .....

Look carefully at the following words and write what you know about each word in the space provided. You may make a drawing or sketch wherever you think it will help to make your answer clear.

1. Foyer .....
2. Stanley Gibbons .....
3. Brief time .....
4. Snowey White .....
5. Dummy hand .....
6. Flex .....
7. Mona Lott .....
8. Ace .....
9. Cotter pin .....
10. Phil Mason .....
11. Rookery .....
12. Oilstone .....
13. Barry Steel .....
14. No-ball .....
15. Orson Welles .....
16. Spokeshave .....
17. Dudley Davenport .....
18. Peter Lorre .....
19. Shooting board .....
20. Jackie Drake .....
21. Andante .....
22. Field event .....
23. Miss Hotchkiss .....
24. Check .....
25. Academy award .....
26. Dihedral angle .....
27. Dicky Bumblebee .....
28. Castling .....
29. Barry Fitzgerald .....
30. Projection lens .....

31. Briar .....

32. The Honorable Phoebe .....

33. Stalemate .....

34. Rip Magee .....

35. Perennial .....

36. Sir Adrian Boult .....

37. Nick Smith .....

38. Trump suit .....

39. Sophie Tuckshop .....

40. Size .....

41. Corner kick .....

42. Lexicon .....

43. J. Arthur Rank .....

44. Ground Sheet .....

45. Zachary Scott .....

46. Draughts .....

47. Thomas Beecham .....

48. Bergen .....

49. Priming Paint .....

50. Colonel Chinstrap .....

APPENDIX C

The Marking Keys

Appendix C

Marking Key	Test 1
Bishop's pawn	A chess piece
The Iron Teacher	Character from a comic paper
Valve holder	Part of a wireless set
Wagtail	Small bird
Compost	Garden refuse, manure
Trailer	Shown in advance of a film
Arpeggio	In music, a series of notes
Vice	For hold materials on a workbench
Mr. Keen	Radio act, 'Waterlogged Spa'
No-jump	Long-jumping, foot over take-off board
St. Alfrics	School in comic paper
Bevel	Slanting edge
'U' film	Film for exhibition to all ages
Point	Position on cricket field
Tang	Part of file fitting into the handle
Anne Shelton	Radio singer
Float	To remain afloat when swimming
Ralph Richardson	Film star
Monopoly	Table game
Pass	To transfer the ball in football or rugby
Danny Kaye	American comedian
Acrostic	Word puzzle
Lock	Rugby forward
James Mason	Film star

Alan Patterson	Scottish high jumper
Box office	Where tickets are bought in a cinema
Jack	Playing card
Ash	Tree
Ted Heath	Dance band leader
Lipstone college	From a comic paper
Stalls	Cinema seats
Stewart Grainger	Film star
Stop number	On a camera
Jib	Sail on a boat
Touch	Touchline in football or rugby
Mounts	For fixing stamps
Drone	Bee
Developer	Chemical used in photography
Tackle	In football or rugby
Edmundo Ros	Dance band leader
Conifer	Tree such as pine, fir etc.
Sexton Blake	From comic paper
Jib-boom	Spar for the jib sail
Penny black	Postage stamp
Jane Russell	Film star
Sweated joint	Joint on a lead pipe
Double blank	Domino
Ethel 'Igginbottom	From radio act
Tone arm	Part of a gramophone
Biplane	Aeroplane with two sets of wings

Marking Key	Test 2
Guy rope	Supporting rope for tent or mast
M. G. M.	Film company
The Falcon	From a comic paper
Crustacean	Sea animal with shell
Place kick	In football or rugby
Margaret Lockwood	Film star
Tinker	Sexton Blake's assistant
Solitaire	Game with marbles or cards
Blue Mauritius	Postage stamp
Reginald Dixon	Organist often heard on radio
Fuselage	Body of aeroplane
Roulette	Gambling game
Warren	Where rabbits live
Rawlplug	Used when fixing screws in walls
James Cagney	Film star
Bail	Used in cricket
Bradawl	Small boring tool
Red Campion	Wild flower
Jimmy Topper	From comic paper
Sam Costa	Radio artist
Deadly nightshade	Wild flower
Pawn	Chesspiece
'A' film	Film to be shown to adults only
Square leg	Position on cricket field
Danny Longlegs	From comic paper

Variable condenser	Used in a wireless set
Gambit	Opening move in chess
Dr. Oliver Dither	Radio act, 'Waterlogged Spa'
Artificial respiration	To restore breathing after immersion
Wolf note	Harsh note produced by some violins
Morgyn the Mighty	From comic paper
Hacksaw	Saw for cutting metals
Pentathlon	Event in the Olympic Games
Wetherby Wet	'Waterlogged Spa'
Oscar	Film award
Rook or Castle	Chess piece
Plane Iron	Cutting iron on a plane
Mr. Blake the sexton	'Much-Binding-in-the-Marsh'
Limpet	Shelled animal found on shore rocks
Stroboscope	For timing a gramophone turntable
Korky	Cat in comic paper
Beech	Tree
Crawl	Swimming stroke
Humphrey Bogart	Film star
Jesse Owens	Sprinter and long-jumper
Annealing	Treatment of metals
Checkmate	Chess move
Lord Waterlog	'Waterlogged Spa'
Rowlock	Rest for oar in rowing boat

Marking Key	Test 3
Philatelist	Stamp collector
Negative	Photograph
Arthur Lucan	Film and Radio star
Abundance	Bid in cards
Fuse box	Safety fitting in electrical wiring
Hambone Repertory Co.	Radio act.
Grand slam	Bid in Bridge
Inner tube	Part of a bicycle tyre
Mr. Burp	'Up the Pole'
Ling	Heather
Fair charge	In football
David Niven	Film star
Swallow	Bird
Hands	Offence in football
John Mills	Film star
Maureen Gardner	British hurdler
Star	Outstanding performer on films
Perforation gauge	Used in stamp collecting
Hypo	Chemical used in photography
Stewart Macpherson	B.B.C. commentator
Misere	Bid in cards
Stop-cock	Main tap in water supply
Whippet Quick	'Charlie Chester Show'
Rubber	A series of games of Bridge
Hub	Centre of a wheel

Horace Hotplate	'Up the Pole'
Anagram	Word puzzle
Off-side	Offence in football or rugby
Gregory Peck	Film star
Bat	Small flying animal
Knock-on	Offence in rugby
Gary Cooper	Film star
Sydnet Wooderson	Long distance runner
Attendant	At a cinema
Watermark	On stamps
Spool	Container for photographic film
Mr. Muddlecombe	Radio character
Trick	Term used in card games
Tap washer	Ring to prevent drips from taps
Frisby	Radio act 'Itma'
Revoking	Offence in cards
Bowden cable	Used on bicycle to transmit force
Sam Spadger	From comic paper
Crossword puzzle	Word puzzle arranged in squares
Foul throw	Offence in football
Alan Ladd	Film star
Solo	Card game
Try	Score in rugby
Cary Grant	Film star
Cathie Gibson	Scottish girl swimmer

Marking Key	Test 4
Foyer	Entrance hall in cinema
Stanley Gibbons	Producer of a stamp catalogue
Brief time	Timing of a camera shutter
Snowey White	Radio act 'Dick Barton'
Dummy hand	Term used in Bridge
Flex	Electric cable
Mona Lott	Radio act 'Itma'
Ace	Card with one symbol
Cotter pin	Fixing pedals to axle on a bicycle
Phil Mason	From comic paper
Rookery	Large collection of rooks' nests
Oilstone	For sharpening chisels
Barry Steel	From comic paper
No-ball	Expression in cricket
Orson Welles	Film star
Spokeshave	For smoothing curved pieces of wood
Dudley Davenport	'Much-Binding-in-the-Marsh'
Peter Lorre	Film star
Shooting board	Used when planing small pieces of wood
Jackie Drake	From comic paper
Andante	Term used in music
Field event	Non-racing event in Athletics
Miss Hotchkiss	'Itma'
Check	Term in chess
Academy award	Film award

FORM IV PHYSICS FEBRUARY 1949 E6

NAME_____

Write your name in the space provided above.
The following statements each have three suggested forms. Underline the one which you think is correct in each case.
Marks will be deducted for wrong answers, therefore DO NOT GUESS.

1. If a bar magnet is suspended at its centre it will set itself a) with the N-pole pointing North, b) with the N-pole pointing South c) pointing East and West.

2. If two bar magnets are placed end on with their N-poles near together they will a) attract each other, b) repel each other, c) not affect each othe

3. If and iron bar is brought near the N-pole of a bar magnet it will a) not affect it, b) repel it, c) attract it.

4. If an iron bar is brought near the centre of a bar magnet it will a) not affect it, b) repel it, c) attract it.

5. If the N-pole of a bar magnet is brought near the centre of an iron bar it will a) not affect it, b) repel it, c) attract it.

6. If the N-pole of a bar magnet is brought near the centre of a copper bar it will a) not affect it, b) repel it, c) attract it.

7. If a bar magnet is floated on a cork on water it will a) stay still b) move northwards, c) move southwards.

8. A strong bar magnet is broken in half. The result is a) no magnets b) one strong and one weak magnet, c) two equally strong magnets.

9. A bar of iron is pointed North and South and struck sharply with a hamme The end which was pointing North a) becomes a S-pole, b) becomes a N-pole c) remains neutral.

10. When the N-pole of a bar magnet is stroked along a soft iron bar which lies East and West the end where it leaves the bar a) becomes a N-pole b) becomes a S-pole, c) remains neutral.

11. When you are looking at the end of a solenoid so that the current appears to be going clockwise, that end is a) neutral, b) a N-pole, c) a S-pole.

12. If the current is now reversed the same end is now a) neutral b) a N-pole, c) a S-pole.

13. If a soft iron bar is pushed into a solenoid carrying a current the magnetic field will be a) unchanged, b) weakened, c) strengthened.

14. If a copper bar is used instead of iron in 14, the magnetic field will be a) unchanged, b) weakened, c) strengthened.

15. The core of an electromagnet is made of a) steel, b) iron, c) copper.

16. If steel was used for the core of the electromagnet in an electric bell, when the current was made the bell would a) not ring at all, b) ring continuously, c) strike once and then stop.

17. The moving coil galvanometer works on the same principle as a) the electric motor, b) the electric generator, c) the tangent galvanometer.

18. In an electric motor or dynamo the moving part is called a) the galvanometer, b) the commutator, c) the armature.

19. For the self-starter on a motor car you would use a) a shunt wound DC moto b) a series wound DC motor , c) a shunt wound DC dynamo.

20. If DC is supplied to a motor fitted with slip rings the armature will a) remain at rest, b) move through a few degrees and then stop, c) rotate continuously.

FORM IV (cont.)

21. When the N-pole of a bar magnet is pushed into a coil of wire the needle of a galvanometer connected to the coil moves to the right. When the magnet is at rest inside the coil the galvanometer needle will
a) still remain at the right, b) read zero, c) move to the left.

22. Whenever an induced current is produced it is always in such a direction as to oppose the change producing it. This statement is known as
a) Faraday's Law, b) Lenz's Law, c) Amperes Rule.

23. An AC dynamo can be made into a DC dynamo by
a) using slip rings instead if a commutator
b) using a commutator instead of slip rings
c) supplying DC to the field windings.

24. To obtain a steadier current from a DC dynamo you would use
a) a stronger field magnet, b) a greater number of armature windings
c) bigger brushes.

25. A "step-up" transformer converts a) low voltage DC to high voltage DC
b) high voltage DC to low voltage DC, c) Low voltage AC to high voltage AC

The following are for Form IVa only

26. A negatively charged ebonite rod is brought up to a positively charged glass rod. They will a) repel each other, b) attract each other,
c) not affect each other.

27. A negatively charged ebonite rod is brought up to an uncharged ebonite rod. They will a) repel each other, b) attract each other,
c) not affect each other.

28. A copper rod when rubbed with dry fur a) becomes negatively charged,
b) becomes positively charged, c) does not become charged.

29. A negatively charged rod is brought up to one end of an insulated, uncharged conductor. The end of the conductor nearest to the rod now has
a) an induced negative charge, b) an induced positive charge,
c) no charge at all

30. The negatively charged rod is now removed. The same end of the insulated conductor now has a) an induced negative charge, b) an induced positive charg
c) no charge at all.

PART 2

Answer three of the following five questions.

1. State the Principle of Moments and describe how you would verify it experimentally.

A uniform rod 100 cms. long balances about its midpoint. If a xxxxxx 100 gm. weight hangs at one end, what weight placed 40 cms. from the pivot will balance it?

2. Draw a labelled diagram of a Leclanche cell and explain the function of the various parts of the cell.

3. Draw a labelled diagram of an electric bell and explain how it works

4. Describe briefly how you would make a DC electric motor, and give the reasons for using the various components.

5. Write out five of the following laws and definitions :-
   a) Moment of a force.
   b) Law of action between magnetic poles.
   c) Line of magnetic force.
   d) Polarisation.
   e) Lenz's Law.
   f) Faraday's Law.
   g) The Left Hand Rule.

37. I am looking for the book. Je cherche ( ). 37.....
38. He has two newspapers (journal). Il a deux ( ). 38.....
39. He is less rich than you. Il est ( ) riche que vous. 39.....
40. Where are those pens? Où sont ( ) plumes? 40.....
41. He throws (jeter) the ball. Il ( ) la balle. 41.....
42. A beautiful (beau) child. Un ( ) enfant. 42.....
43. Which pen (la plume) have you? ( ) plume avez-vous? 43.....
44. Books are useful. ( ) sont utiles. 44.....
45. Where is that girl. Où est ( ) jeune fille? 45.....
46. The women are small (petit). Les femmes sont ( ). 46.....
47. We are warm. Nous ( ) chaud. 47.....
48. He has closed (fermer) the door. Il ( ) la porte. 48.....
49. They have done (faire) the work. Ils ( ) le travail. 49.....
50. He is selling (vendre) the car. Il ( ) l'auto. 50.....
51. He goes (aller) to London. Il ( ) à Londres. 51.....
52. I shall finish (finir) the work. Je ( ) le travail. 52.....
53. They are not washing themselves. Ils ( ) lavent pas. 53.....
54. He will close (fermer) the door. Il ( ) la porte. 54.....
55. I say nothing. Je ( ) dis ( ). 55.....
56. He has finished (finir) the work. Il ( ) le travail. 56.....
57. Do not do that. Ne faites pas ( ). 57.....
58. Has Henry spoken? Henri ( ) parlé? 58.....
59. The first (premier) lesson. La ( ) leçon. 59.....
60. An old (vieux) lady. Une ( ) dame. 60.....
61. The man to whom you speak. L'homme à ( ) vous parlez. 61.....
62. I have not any books. Je n'ai pas ( ) livres. 62.....
63. We were talking (parler) when he came in. Nous () quand il est entré. 63.....
64. They are their friends. Ce sont ( ) amis. 64.....
65. Come and see (voir) your friend. Venez ( ) votre ami. 65.....
66. Henry the First. Henri ( ). 66.....
67. We are going to France. Nous allons ( ) France. 67.....
68. He used to go (aller) there each day. Il y ( ) chaque jour. 68.....
69. It is half past twelve (mid-day). Il est ( ). 69.....
70. All (tout) the men. ( ) les hommes. 70.....
71. HE says so. ( ), il le dit. 71.....
72. I have some money. J'ai ( ) argent. 72.....
73. Have you seen him? ( ) vu? 73.....
74. He has some. Il ( ) a. 74.....
75. He is as big as you. Il est ( ) grand que vous. 75.....
76. They have got up (se lever). Ils ( ). 76.....
77. Which books have you? ( ) livres avez-vous? 77.....
78. Your pen? I have not found (trouver) it. Ta plume? Je ne l'ai pas ( ). 78.....
79. I was driving (conduire) the car. Je ( ) l'auto. 79.....
80. They have gone away (partir). Elles ( ). 80.....
81. He finished by going out (sortir). Il finit par ( ). 81.....
82. He gives it to us. Il ( ) donne. 82.....
83. I give them to them. Je ( ) donne. 83.....
84. He has been seen. ( ) l'a vu. 84.....

E4

French Grammar Test Form B.

Name of School: _____ Form: _____

Surname: _____ Initials: _____ Boy or Girl: _____

Age: Yrs. ___ Mths. ___. Position on last French examination. _____

By the end of this term I shall have completed ( ) years of study of French.

INSTRUCTIONS.

Below are 100 English sentences or phrases followed by an incomplete French translation. Complete the translation by putting the missing French word or words (~~in the blanks~~) at the right hand side of the paper. Write clearly and in ink.

Work through doing all the easy ones, and come back to the harder ones later. Do not spend too long on any one item. Time Allowance - 35 minutes.

Example: 1. The men. ( ) hommes. _____ 1...les.....

1. The boy. ( ) garçon. 1.....
2. A lady. ( ) dame. 2.....
3. The child. ( ) enfant. 3.....
4. The children. Les ( ). 4.....
5. A pretty (joli) child. Un ( ) 5.....
6. The tenth of June. Le ( ) juin. 6.....
7. Who is speaking? ( ) parle? 7.....
8. Two little (petit) boys. Deux ( ) garçons. 8.....
9. Two intelligent (intelligent) women. Deux femmes ( ). 9.....
10. The boys are small (petit). Les garçons sont ( ). 10.....
11. A yellow (jaune) chair. Une chaise ( ). 11.....
12. You are not speaking. Vous ( ) parlez ( ). 12.....
13. They are (être) with us. Ils ( ) avec nous. 13.....
14. We have (avoir) a car. Nous ( ) une auto. 14.....
15. The man who is there. L'homme ( ) est là. 15.....
16. It is my school. C'est ( ) école. 16.....
17. The chair which you see. La chaise ( ) vous voyez. 17.....
18. What do you see? ( ) voyez-vous? 18.....
19. In summer. ( ) été. 19.....
20. He strikes them. Il ( ) frappe. 20.....
21. The children's books. Les livres ( ) enfants. 21.....
22. A happy (heureux) woman. Une femme ( ). 22.....
23. I am finishing (finir) the exercise. Je ( ) l'exercice. 23.....
24. I go to school. Je vais ( ) école. 24.....
25. Your friends? They are there. Vos amis? ( ) sont là. 25.....
26. A new (nouveau) girl. Une ( ) élève. 26.....
27. The weather is fine. Il ( ) beau. 27.....
28. Captain (capitaine) Lebrun. ( ) Lebrun. 28.....
29. He gives the book to the boy. Il donne le livre ( ) garçon. 29.....
30. I am washing myself. Je ( ) lave. 30.....
31. You do (faire) the work. Vous ( ) le travail. 31.....
32. There are two men here. ( ) deux hommes ici. 32.....
33. I am looking at the book (le livre). Je regarde ( ). 33.....
34. It is her brother. C'est ( ) frère. 34.....
35. A blue (bleu) book. Un ( ). 35.....
36. To whom are you speaking? A ( ) parlez-vous? 36.....

(TURN OVER)

37. It is their friend. C'est ( ) ami. 37.....
38. Is Peter there? Pierre ( ) là? 38.....
39. All (tout) the women. ( ) les femmes. 39.....
40. Where is that boy? Où est ( ) garçon? 40.....
41. He is hungry. Il ( ) faim. 41.....
42. He goes there. Il ( ) va. 42.....
43. He has two horses (cheval). Il a deux ( ). 43.....
44. The weather is cold. Il ( ) froid. 44.....
45. Do not touch (touchez) me. ( ). 45.....
46. A new (neuf) pen. Une plume ( ). 46.....
47. The man of whom you speak. L'homme ( ) vous parlez. 47.....
48. Henry the Second. Henri ( ). 48.....
49. We have heard (entendre) the noise. Nous ( ) le bruit. 49.....
50. I have some good books. J'ai ( ) bons livres. 50.....
51. A new (nouveau) boy. Un ( ) élève. 51.....
52. The girls are tall (grand). Les jeunes filles sont ( ). 52.....
53. I am selling (vendre) the house. Je ( ) la maison. 53.....
54. Which pens have you? ( ) plumes avez-vous? 54.....
55. They are not cutting themselves. Ils ( ) coupent pas. 55.....
56. I shall carry (porter) the luggage. Je ( ) les bagages. 56.....
57. They go (aller) to Paris. Ils ( ) à Paris. 57.....
58. We shall finish (finir) the work. Nous ( ) le travail. 58.....
59. In spring. ( ) printemps. 59.....
60. I give them to him. Je ( ) donne. 60.....
61. She has written (écrire) the letter. Elle ( ) la lettre. 61.....
62. He is waiting for the train (le train). Il attend ( ). 62.....
63. Go and get (chercher) the doctor. Allez ( ) le médecin. 63.....
64. She has washed herself (se laver). Elle ( ). 64.....
65. He left without speaking. Il partit sans ( ). 65.....
66. He gives them to me. Il ( ) donne. 66.....
67. Whom do you see? ( ) voyez-vous? 67.....
68. Give (Donnez) it to me. ( ). 68.....
69. It was raining (pleuvoir) when he came in. Il ( ) quand il entra. 69.....
70. You used to go (aller) to see him. Vous ( ) le voir. 70.....
71. Which book have you? ( ) livre avez-vous? 71.....
72. Who is there? I am. Qui est là? ( ). 72.....
73. I was finishing (finir) the work. Je ( ) le travail. 73.....
74. Your books? I have not found (trouver) them.
Vos livres? Je ne les ai pas ( ). 74.....
75. I see nobody. Je ( ) vois ( ). 75.....
76. You have read (lire) the book. Vous ( ) le livre. 76.....
77. An old (vieux) friend. Un ( ) ami. 77.....
78. He has not seen him. Il ( ) vu. 78.....
79. He began by answering (répondre). Il commença par ( ). 79.....
80. If he arrives (arriver), I shall see him. S'il ( ), je le verrai. 80.....
81. He is going to Canada. Il va ( ) Canada. 81.....
82. I am listening to the music (la musique). J'écoute ( ). 82.....
83. I am told he is coming. ( ) me dit qu'il vient. 83.....

E2

French Grammar Test Form A.

Name of School: _____ Form: _____

Surname: _____ Initials: _____ Boy or Girl. _____

Age: Yrs.____ Mths.____. Position on last French examination_____

By the end of this term I shall have completed ( ) years of study of French.

INSTRUCTIONS.

Below are 100 English sentences or phrases followed by an incomplete French translation. Complete the translation by putting the missing French word or words at the right hand side of the paper. Write clearly and in ink.

Work through doing all the easy ones, and come back to the harder ones later. Do not spend too long on any one item. Time Allowance - 35 minutes.

Example: 1. The men. ( ) hommes. _____ 1. les.

1. The lady. ( ) dame. 1.....
2. A gentleman. ( ) monsieur. 2.....
3. The friend. ( ) ami. 3.....
4. The friends. Les ( ). 4.....
5. The first of July. Le ( ) juillet. 5.....
6. We are eating (manger). Nous ( ). 6.....
7. I walk to the window (la fenêtre). Je marche ( ). 7.....
8. A good (bon) book. Un ( ). 8.....
9. Who is there? ( ) est là? 9.....
10. Two little (petit) women. Deux ( ) femmes. 10.....
11. Two intelligent (intelligent) men. Deux hommes ( ). 11.....
12. He touches me. Il ( ) touche. 12.....
13. A red (rouge) flower. Une fleur ( ). 13.....
14. You do not understand. Vous ( ) comprenez ( ). 14.....
15. We are (être) in the drawing-room. Nous ( ) dans le salon. 15.....
16. They have (avoir) a garden. Ils ( ) un jardin. 16.....
17. A beautiful (beau) house. Une ( ) maison. 17.....
18. He is bigger than you. Il est ( ) grand que vous. 18.....
19. I have some bread (le pain). J'ai ( ) pain. 19.....
20. The chair which is in the room. La chaise ( ) est dans la salle. 20.....
21. The lady's dog. Le chien ( ) dame. 21.....
22. The green (vert) book. Le ( ). 22.....
23. The books are green (vert). Les livres sont ( ). 23.....
24. It is half past two. Il est ( ) 24.....
25. I give the books to the pupils. Je donne les livres ( ) élèves. 25.....
26. A brave (courageux) girl. Une jeune fille ( ). 26.....
27. I have carried (porter) the luggage. J' ( ) les bagages. 27.....
28. Where is that man? Où est ( ) homme? 28.....
29. The books? They are there. Les livres? ( ) sont là. 29.....
30. The man whom you see. L'homme ( ) vous voyez. 30.....
31. Books are dear. ( ) sont chers. 31.....
32. They are our books. Ce sont ( ) livres. 32.....
33. You tell (dire) the truth. Vous ( ) la vérité. 33.....
34. He is finishing (finir) the work. Il ( ) le travail. 34.....
35. I am preparing myself. Je ( ) prépare. 35.....
36. It is his sister. C'est ( ) soeur. 36.....

French Grammar Test Form B. (Continued)

85. Pass (Passez) it to him. ( )

86. She has put (mettre) the letter here. Elle ( ) la lettre ici.

87. You would see (voir) my friend, if you waited.
Vous ( ) mon ami, si vous attendiez.

88. The house in which he lives. La maison dans ( ) il demeure.

89. You do not believe what I say. Tu ne crois pas ( ) je dis.

90. Do not take (prenez) it. ( ) 90.....

91. I ask him to come. Je ( ) demande ( ) venir.

92. Here are the pens? But where is his?
Voici les plumes. Mais où est ( )?

93. He had been there two days. Il ( ) là depuis deux jours.

94. The man whose son (le fils) you see. L'homme ( ) vous voyez ( ).

95. Before speaking, he stood up. Avant de ( ), il se leva.

96. If he came, I should go. S'il ( ), je m'en irais.

97. I want you to speak. Je désire que vous ( ).

98. It is impossible that he has gone (partir).
Il est impossible qu'il ( ).

99. I was sorry that he had gone (partir). J'étais fâché qu'il ( ).

100. He punished him without his having spoken.
Il l'a puni sans qu'il ( ).

84. Little Henry. ( ) Henri. 84.....

85. He is not as big as you. Il n'est pas ( ) grand que vous. 85.....

86. She has come home (rentrer). Elle ( ). 86.....

87. What are you talking about? De ( ) parlez-vous? 87.....

88. I should like (vouloir) to see him. Je ( ) le voir. 88.....

89. There were two books on the table. ( ) deux livres sur la table 89.....

90. The chair on which he is seated. La chaise sur ( ) il est assis. 90.....

91. Here are the books. But where is mine?
Voici les livres. Mais où est ( )? 91.....

92. I told him to come. Je ( ) ai dit ( ) venir. 92.....

93. He has been there two days. Il ( ) là depuis deux jours. 93.....

94. Look at this. Regardez ( ). 94.....

95. You do not know what is happening. Tu ne sais pas ( ) se passe. 95.....

96. The man in whose house he lives. L'homme dans ( ) il demeure. 96.....

97. I want you to come (venir). Je veux que vous ( ). 97.....

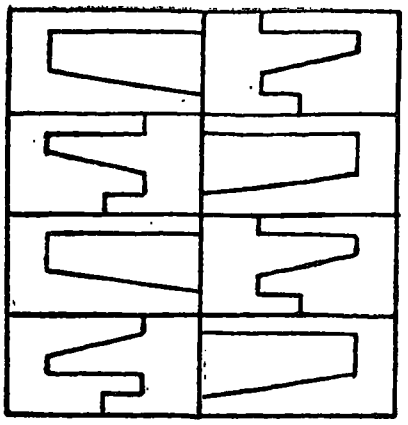
98. Although he had come. Quoiqu'il ( ). 98.....

99. I am pleased that his friend has come.
Je suis content que son ami ( ). 99.....

100. It is possible that he has finished.
Il est possible qu'il ( ) 100.....

APPENDIX E

The School Examination Papers



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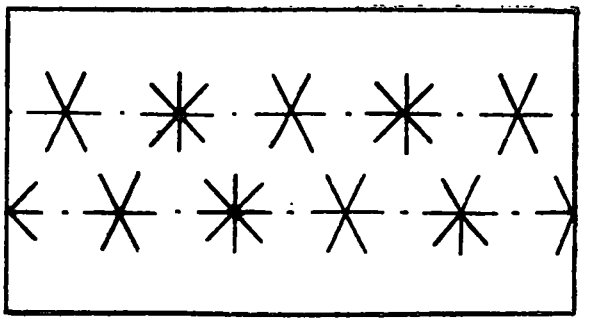

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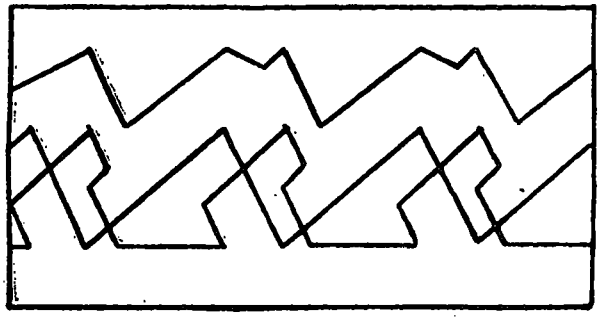

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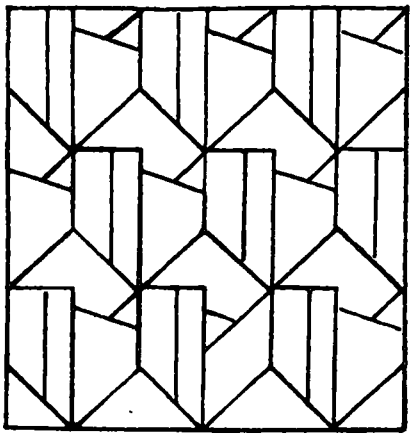

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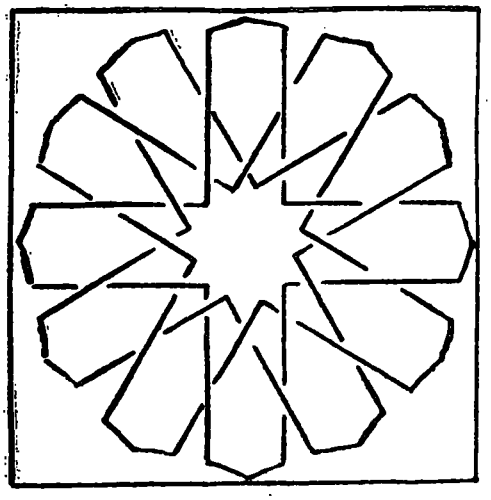

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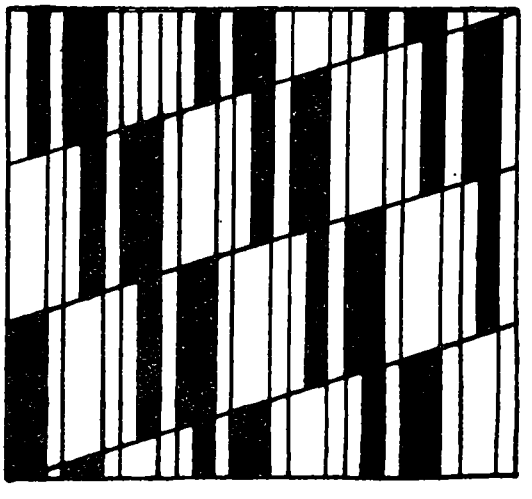
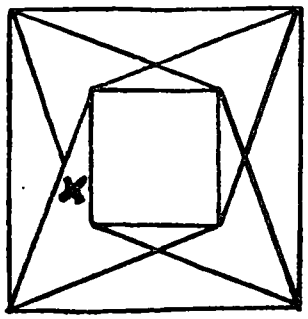
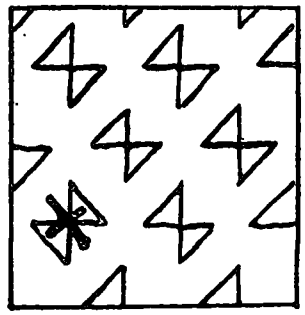


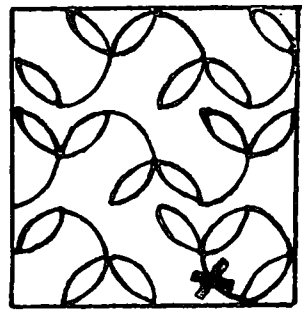
10.

Z. (5 Minutes).

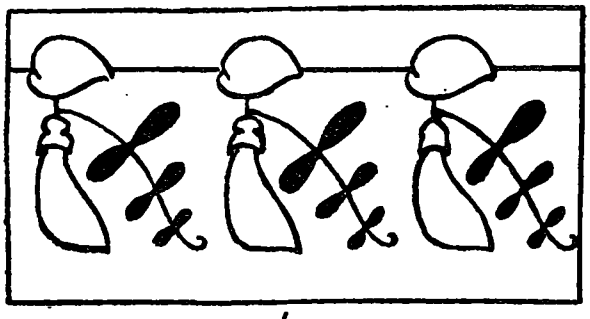
There is a fault in each of the following patterns. You are to find this fault and mark it with a cross X. Here are three patterns which have been done for you.



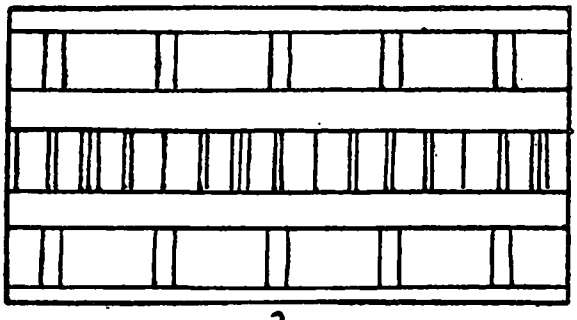




NOW DO THESE:—



1.



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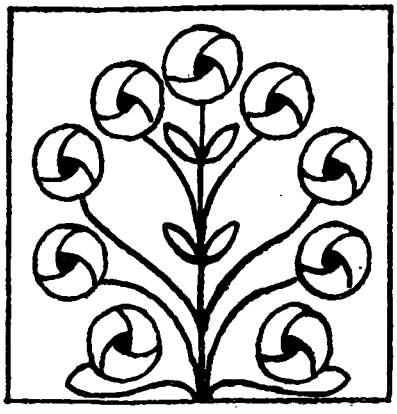

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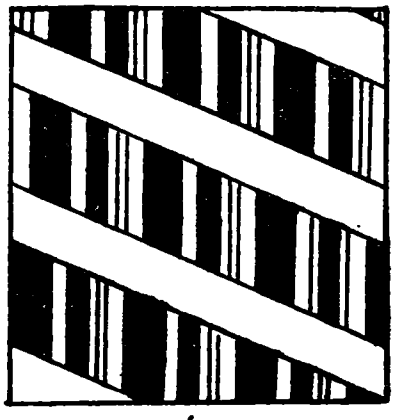
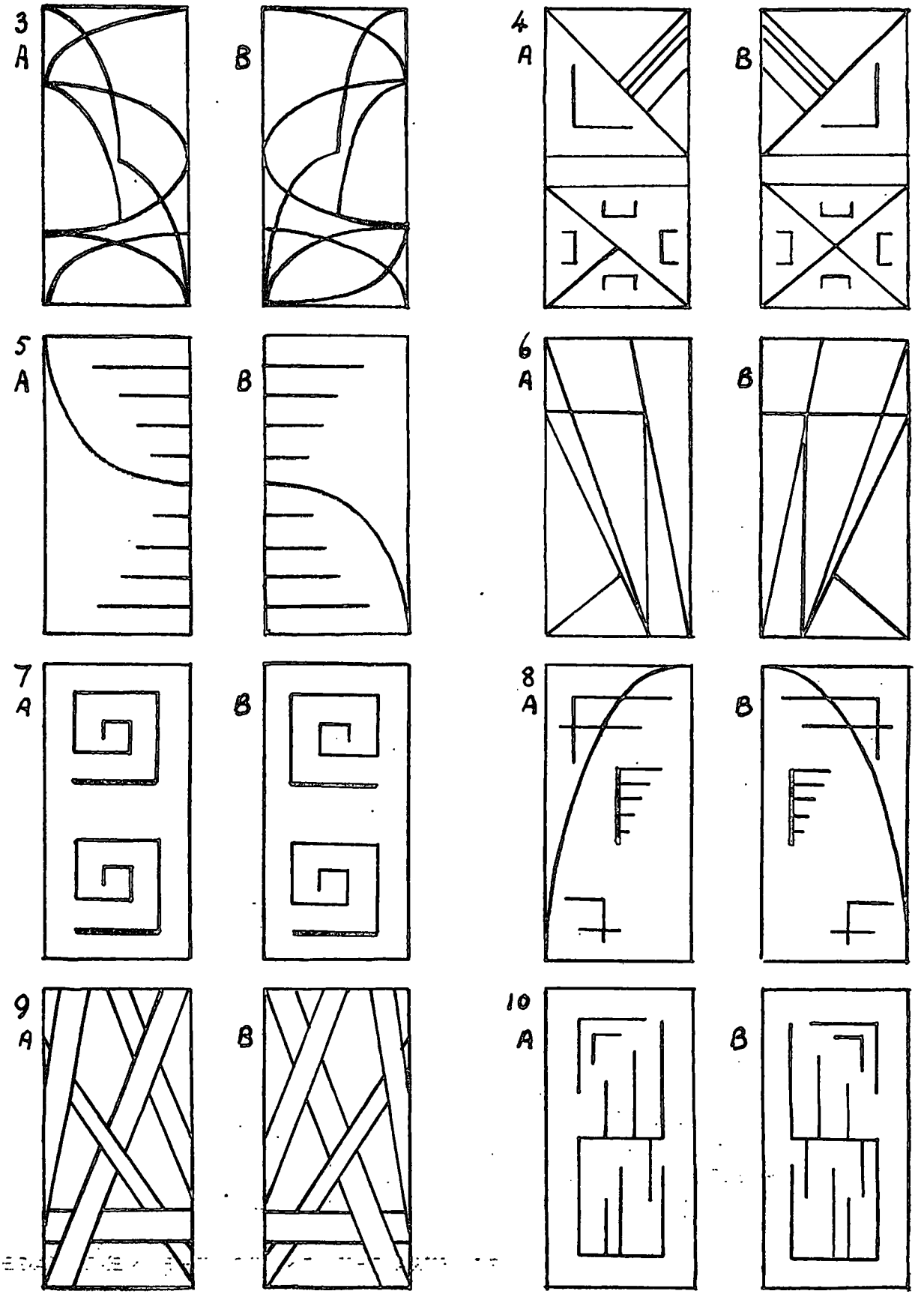


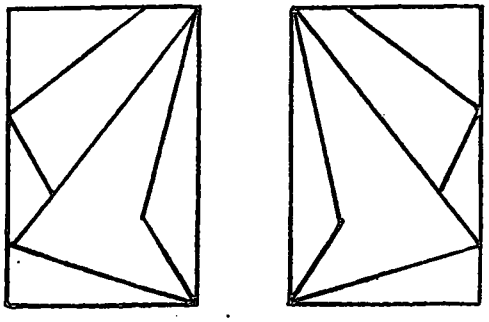
4.

GO STRAIGHT ON TO THE NEXT PAGE.

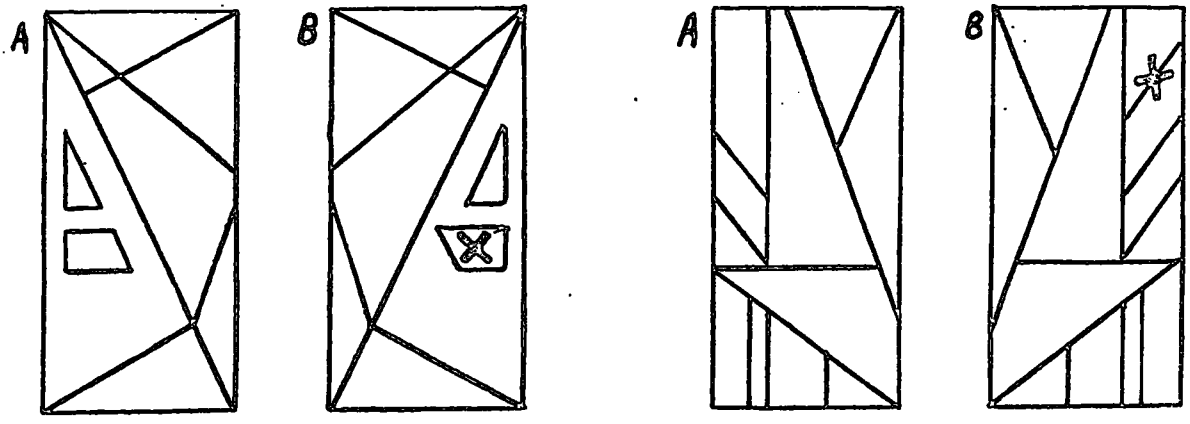

3
A
B
4
A
B
5
A
B
6
A
B
7
A
B
8
A
B
9
A
B
10
A
B

Y. (5 Minutes).

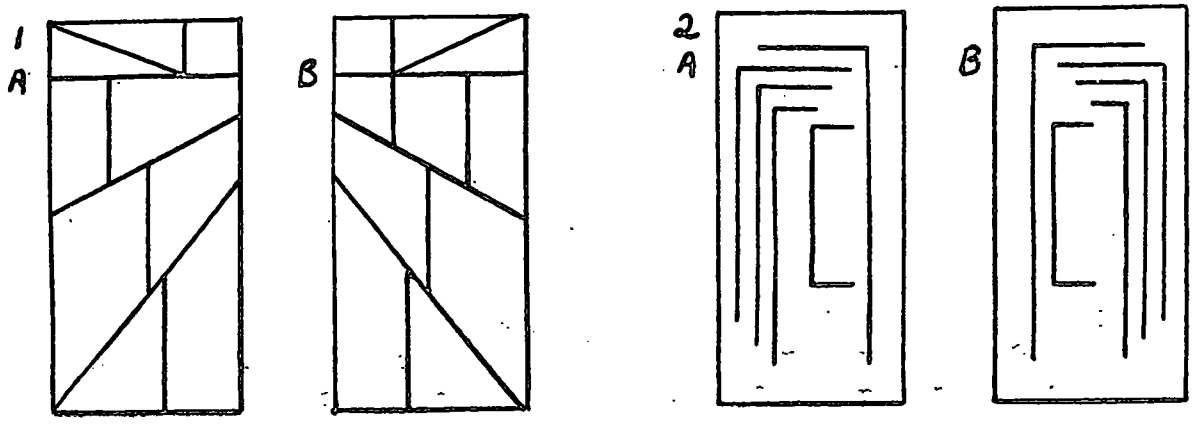
Here are two halves of a design which, when fitted together, make a balanced pattern.



Now look at the two designs below. In each case there is something wrong with the half B so that when it is fitted to the half A it does not make a balanced pattern. The wrong part has been marked with a cross.



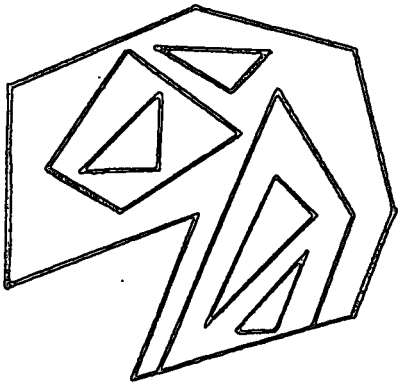
Now mark the wrong part in the half pattern B with a cross X in each of the following examples.



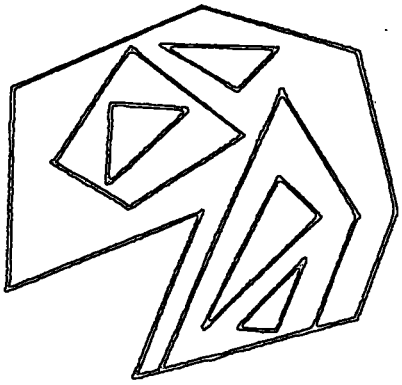
GO STRAIGHT ON TO THE NEXT PAGE.

X.

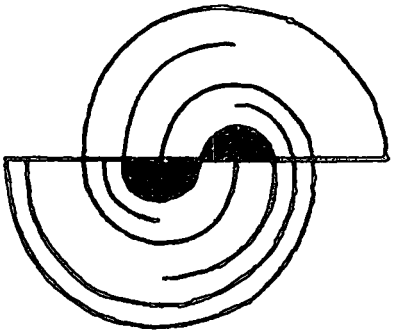
5A



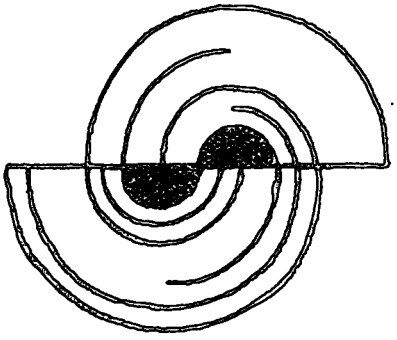
5B



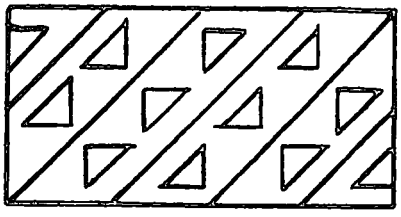
6A



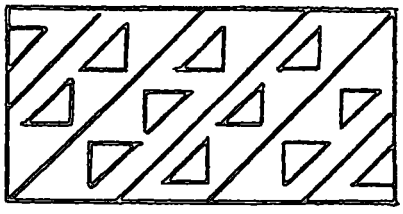
6B



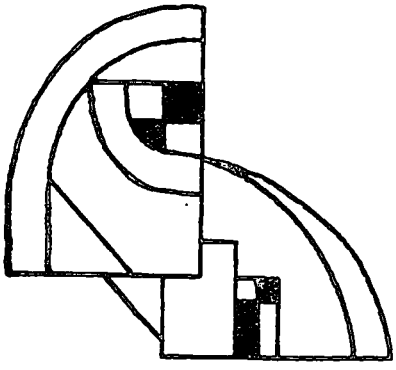
7A



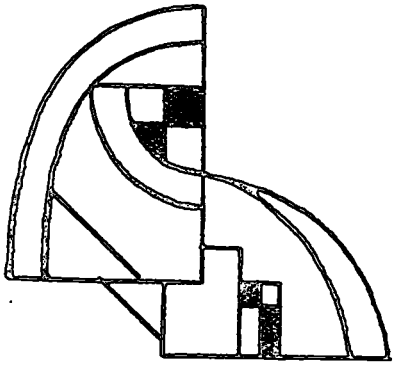
7B



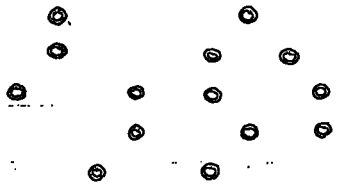
8A



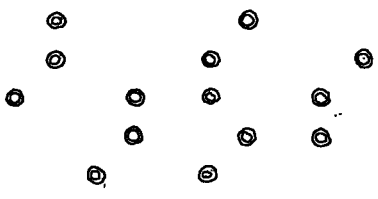
8B



9A



9B

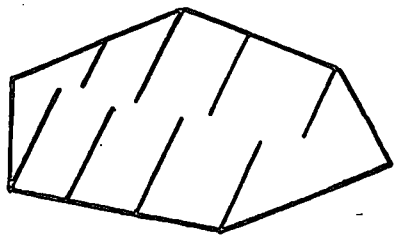


X.

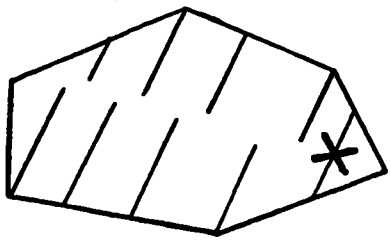
(5 Minutes).

Below are pairs of patterns marked A and B. The second pattern B is different from the first pattern A. You are to find where B is different and mark the different pattern on B with a cross X. DO NOT MARK A. (The first one has been done for you.)

A

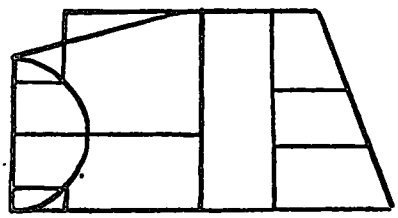


B

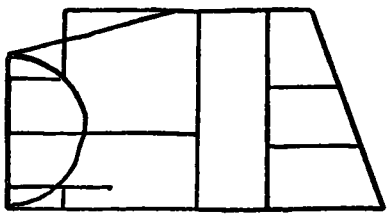


NOW DO THESE :—

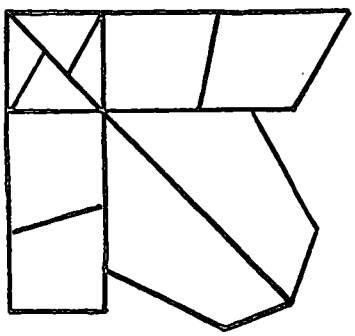
1A



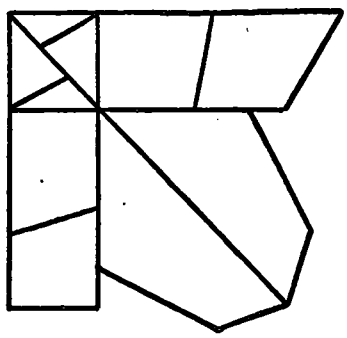
1B



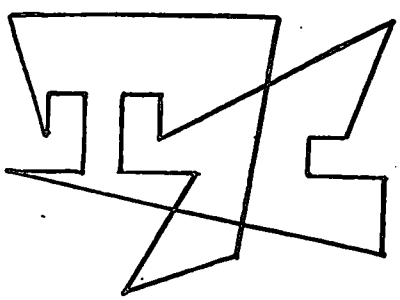
2A



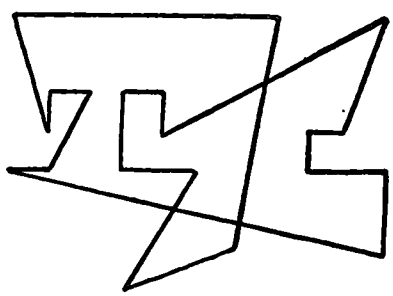
2B



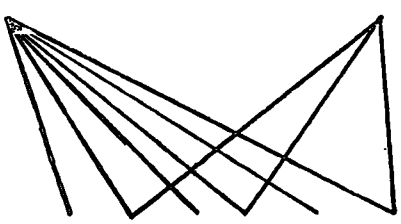
3A



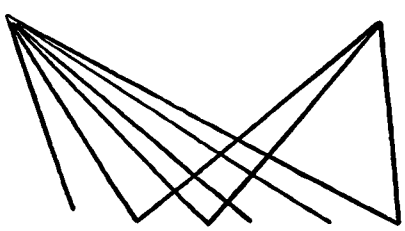
3B



4A



4B



GO STRAIGHT ON TO THE NEXT PAGE.

D 9

DO NOT OPEN THIS BOOK UNTIL YOU ARE TOLD TO DO SO.

SURNAME.....

CHRISTIAN NAMES.....

SCHOOL .....

DATE OF BIRTH.....

AGE .....years .....months

DATE OF TAKING TEST..... I.Q.....

V. S. 10.

(TIME : 15 MINUTES)

E. A. PEEL.
University of Durham.

Answer as many as possible of the exercises in this book.

You will not have time to do them all, and every so many minutes you will be told to stop and go on to the next page.

Be sure to stop whenever you are told.

You need not ask any questions because on each page you are told what to do.

Most of the exercises are easy ; but a few are quite hard.

Waste no time ; but keep on steadily until you are told to stop.

SCORE.	
X	
Y	
Z	
TOTAL ...	

ASK NO QUESTIONS.

DO NOT OPEN THIS BOOK UNTIL YOU ARE TOLD TO DO SO.

Y. (5 minutes)

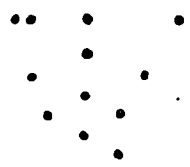
Here is something to show how accurately and quickly you can work. There are sets A and B of groups of words and signs. There is **one** part of B which is different from A. You are to put a ring around this different part in B. Be careful to place your ring around the different part. Do NOT touch A. Here are three that have been done for you :

A

YB:KL/HSSB-,

a,z,K-I

t p,p.q

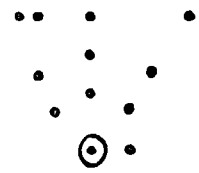


B

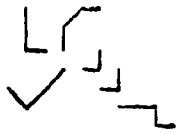
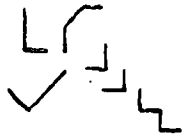
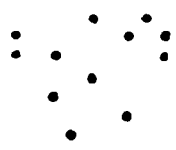
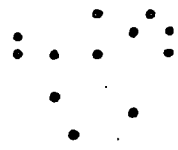
YB:KL/(r)SSB-,

a,z,K-I

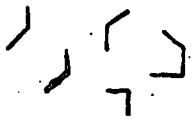
t p,p(,)q

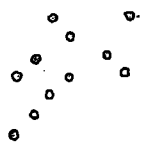


Now do these :

1.	AJ-/:OB.LBLB	AJ-/:OB.BBLB
2.	-2 -I T (I)P K n-4 P 3	-2 -4 T (I)P K n-4 P 3
3.	J.Crim. A. Hrdlicka Psychopath. 1:87,1939	J.Crim. A. Hirdlicka Psychopath. 1:87,1939
4.	mpfdhyfpaassw	mpfdhgfpaassw
5.		
6.	Metrazol-Thalamus 41:504	Metrozol-Thalamus 41:504
7.	thyroidectomy	thyroidictomy
8.	KLEPD;SioL.,KD.T.	LKEPD:SioL.,KD.T.
9.	.E:,;S-T.ED.,KP	.E:,;S-T,ED.,KP
10.	dipsomaniacal	dipsomaniaical
11.	SANK:-,JEV.,)ROU	SANK:-.JEV.,)ROU
12.	eisoptrophobia	eisophtrophobia
13.	graphoencephaloelectrics	graphoencephalaelectrics
14.		

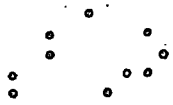
GO STRAIGHT ON.

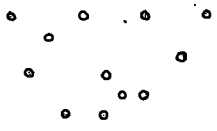
15. 

16. 

17. Catalepobocapnine

18. bsgc
ctss
pnbc

19. 

20. 

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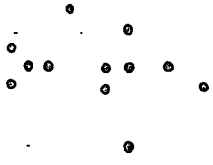
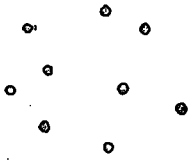
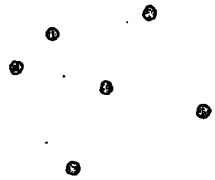
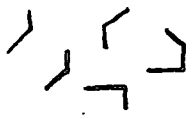
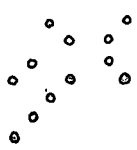
22. 

23. 

24. 





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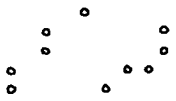

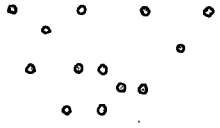

S S
(T;I?L :P.,)
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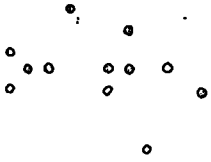
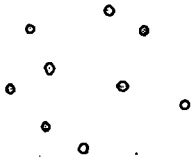


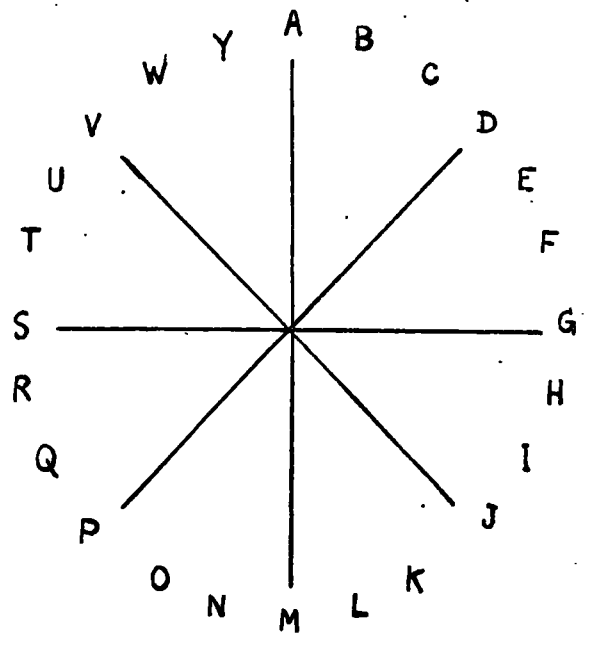


Ann is taller than Elizabeth. Gladys is smaller than Elizabeth but taller than Mary. Christina is taller than Daphne and both are between Ann and Elizabeth in height.

66. Who is the third tallest ? .....

67. Who are not so tall as Christina ? .....

68. Who is smaller than Daphne and taller than Gladys ? .....



A code is formed from the circle of letters by making a quarter turn in the opposite direction to the clock.

69. Write in code : **SELL OUT**

70. and decode : **BSFN BWLW**

STOP ! ! DO NOT TURN OVER UNTIL YOU ARE TOLD.

LOOK OVER YOUR ANSWERS IN THE TIME WHICH REMAINS.

X.

In each of the lines below, two of the words on the right mean the **opposite** of the word on the left. Find the two words and draw a line under each of them. Here is one that has been done for you :—

hard ..... big soft light easy wooden

49. **light** ..... **bright gas heavy dark blue**
50. **old** ..... **new middle-aged young grey former**
51. **dull** ..... **dim shiny cloudy clever bad**
52. **rough** ..... **calm tough gentle uneven storm**
53. **right** ..... **unhurt helpful wrong lawful left**
54. **common** ..... **private often unusual many open**
55. **clear** ..... **deep muffled gay dull weather**

Mary, Jean and John all have cats as pets. Jean and Tom have dogs and canaries.

56. **Who has three pets ?** .....
57. **Which children have one pet only ?** .....

A shopkeeper has 90 customers to serve. He finds he hasn't enough bacon, cheese and eggs to give all his customers their share of each. Instead of reducing the ration, he gives some no bacon, the same number no eggs and the same number no cheese, so that everyone gets two of the three things.

58. **How many customers get no bacon ?** .....
59. **How many customers get both bacon and cheese ?** .....

Each of the sets of words below can be arranged in order. Think of each set arranged in order and draw a line under the word which comes in the middle of your order.

60. **cold stifling hot warm mild**
61. **talking shouting whispering murmuring speechless**
62. **absence excess plenty insufficiency enough**

In each of the lines below, **two** of the words on the right mean the **same** as the word on the left. Find the two words and draw a line under each of them. Here is one that has been done for you :—

drop ..... fall cut spot water strike

63. **drill** ..... **exercise play work bore hole**
64. **fine** ..... **beautiful thin coarse silk wicked**
65. **beam** ..... **support ray bottom lamp head**

X.

In each of the following rows find the word which is most unlike the others in the same row and draw a line under it :—

29. piano saxophone violin trumpet gramophone

30. ask beg demand reply request

31. afraid nervous tired timid anxious

Each of the sets of words below can be arranged in order. Think of each set arranged in order and draw a line under the word which comes in the middle of your order. Here is one that has been done for you :—

finger-tips, palm finger wrist arm

32. hat jacket shoes trousers scarf

33. spark blaze bonfire flame glow

34. calm wind hurricane storm breeze

35. sardines herring cod shark whale

36. bucket dessert-spoon tea-spoon cup bowl

37. grate hearth chimney chimney-pot chimney-stack

38. vest overcoat shirt coat waistcoat

39. run walk crawl drive cycle

A man is walking north, turns to the left, walks a little further and then to the right, and after a further number of steps, turns round completely to face the way he was last coming.

40. Underline in what direction he now faces : North, South, East or West.

In each line below the sentence on the left can be completed by one of the words on the right. Find the word and draw a line under it.

41. button is to jacket as lace is to — trousers, foot, glove, shoe, curtain

42. gum is to gumboil as toe is to — foot, finger, chilbain, nail, boot

43. film is to cinema as play is to — act, game, theatre, filmstar, actor

44. floor is to carpet as table is to — chair, table-leg, room, tablecloth, teapot

45. pqr is to stu as abc is to — bcd, cba, def, rpq, efg

In each line below, the sentence on the left can be completed by two of the words on the right. Find the two words and draw a line under each of them. Here is one that has been done for you :—

brother is to sister as ..... is to ..... — child boy, father, girl, cousin

46. doctor is to illness as ..... is to ..... — nurse, dentist, toothache, disease, patient

47. horse is to stable as ..... is to ..... — pig, cow, mare, barn, sty

48. puppy is to dog as ..... is to..... — terrier, lamb, wool, mutton, sheep

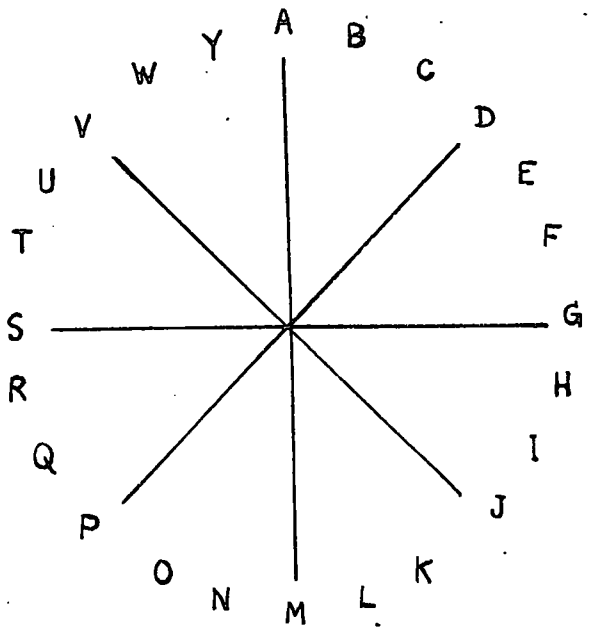
X.

The following table shows how all the children in two classes travel to school :—

	Upper Class Boys	Upper Class Girls	Lower Class Boys	Lower Class Girls
Bus to school	10	9	6	12
Walk to school	3	6	6	2
Cycle to school	8	4	4	3

NOW answer the following questions :—

19. **How many boys go on the bus ?** .....
20. **How many children are there in the upper class ?** .....
21. **How many girls in the lower class do not walk to school ?** .....
22. **How many children in the upper class do not cycle ?** .....
23. **How many girls do not use the bus ?** .....
24. **How many more boys cycle in the upper than in the lower class ?** .....



The circle of letters is to be used as a code by moving three places clockwise, thus A is written D, C is written F, W is written B and so on.

25. **Write the following sentence in code :—**
COME EARLY .....

26. **Decode the sentence :—**
VHQG BDWHU .....

A code is formed from the same circle by representing each letter by the letter opposite to it across the centre of the circle, thus P by D, and W by K, and so on. Give the code message for :

27. **A SHIP IS LOST** .....
28. **Decode the message :—**
GMJQ HTQ PMA .....

X. (30 minutes).

Go straight on until you come to the page where it says " STOP ! DO NOT TURN OVER UNTIL YOU ARE TOLD."

Tom is older than Dick. Mary is not so old as Dick but older than Jim. Bob is younger than Jim.

1. **Who is oldest ?** .....
2. **Who is youngest ?** .....

In each of the following rows, find the word which is most unlike the others in the same row and draw a line under it. Here is one that has been done for you :

yellow dark green blue pink

3.	**mutton**	**bread**	**beef**	**fish**	**pork**
4.	**dog**	**cat**	**lion**	**tiger**	**snake**
5.	**wheat**	**barley**	**turnips**	**clover**	**potatoes**
6.	**house**	**church**	**garden**	**cinema**	**cottage**
7.	**pail**	**pan**	**kettle**	**fork**	**bowl**

In each line below the sentence on the left can be completed by one of the words on the right. Find the word and draw a line under it. Here is one that has been done for you :

Son is to father as daughter is to	brother, sister, mother, uncle, aunt
8. **car is to driver as aeroplane is to**	**wings, pilot, flying, crash, engine**
9. **skill is to clever as knowledge is to**	**learned, book, polite, ignorant, stupid**
10. **cat is to scratch as dog is to**	**kitten, puppy, bite, run, leg.**
11. **John is to Susan as gander is to**	**gosling, goose, girl, goose girl, swan**
12. **duck is to pond as cow is to**	**bull, fish, milk, field, drake**
13. **shopkeeper is to customer as doctor is to**	**disease, medicine, patient, dentist, surgeon**
14. **switch is to electricity as tap is to**	**sink, turn, light, touch, water**
15. **mosquito is to bite as bee is to**	**honey, hive, buzz, sting, poison**

John has a brother and sisters. Pam has 2 brothers. Paul has a brother and a sister and Jean a sister. In all there are the same number of brothers and sisters.

16. **How many brothers are there not counting John and Paul?** .....
17. **How many sisters has John?** .....
18. **Who has no sisters?** .....

D5

ABILITY TEST

Prepared by E. A. Peel with the assistance of D. Graham

University of Durham

FILL IN YOUR

SURNAME .....

CHRISTIAN NAMES .....

SCHOOL.....

DATE OF BIRTH .....

AGE .....years.....months

TO-DAY'S DATE .....

1. Do not begin until you are told.
2. Answer the questions as quickly and carefully as possible. Waste no time.
3. Begin at the beginning and go straight on until you are told to stop.
4. You will be allowed 30 minutes for the first part of the test and will also be told the time after 15 minutes have passed.
5. The second part of the test takes only 5 minutes. You will be told when to start and stop.

SCORE	
X ...	
Y ...	
Total ...	
I.Q.	

22. If a boy can run at the rate of 5 feet in $\frac{1}{5}$ of a second, how many feet can he run in 10 seconds? ㉖ 1 ㉗ 50 ㉘ 250 ㉙ 2 ㉚ 25 .....

23. A thermometer is related to temperature as a speedometer is to —
㉛ fast ㉜ motor-car ㉝ velocity ㉞ time ㉟ hea

24. "State of changing place" is a good definition for —
㊱ advancement ㊲ retardation ㊳ rotation ㊴ motio

25. If the first two statements following are true, the third is (?).
All residents in this block are Republicans.
Smith is not a Republican. Smith resides in this block.
㊶ true ㊷ false ㊸ not certain.....

26. If the words below were arranged to make a good sentence, with what letter would the second word of the sentence begin?
same means big large the as
㊻ a ㊼ b ㊽ m ㊾ s ㊿ t.....

27. Sunlight is to darkness as (?) is to stillness.
(51) quiet (52) sound (53) dark (54) loud (55) moonlight

28. A grandmother is always (?) than her granddaughter.
(56) smarter (57) more quiet (58) older (59) smaller (60

29. Such things as looks, dress, likes, and dislikes indicate one's —
(61) character (62) wisdom (63) personality (64) gossip

30. A tree always has —
(66) leaves (67) fruit (68) buds (69) roots (70) a shadow

31. In general it is safest to judge a man's character by his —
(71) voice (72) clothes (73) deeds (74) wealth (75) face

32. Which of these words is related to many as exceptional is to ordinary?
(76) none (77) each (78) more (79) much (80) few.....

33. This  is to this  as this  is to — ①  ②  ③ 

34. What is related to a cube in the same way that a circle is related to a square?
⑥ circumference ⑦ corners ⑧ sphere ⑨ solid ⑩

35. Which one of these pairs of words is most unlike the other three?
⑪ run — fast ⑫ large — big ⑬ loan — lend ⑭ buy

36. The opposite of awkward is —
⑯ strong ⑰ pretty ⑱ graceful ⑲ short ⑳ swift

37. The two words superfluous and requisite mean —
㉑ the same ㉒ the opposite ㉓ neither same nor opposit

38. Of the five words below, four are alike in a certain way. Which one is not like these fou
㉖ push ㉗ hold ㉘ lift ㉙ drag ㉚ pull.....

39. The idea that the earth is flat is —
㉛ absurd ㉜ misleading ㉝ improbable ㉞ unfair

40. The opposite of loyal is —
㊱ treacherous ㊲ enemy ㊳ thief ㊴ coward ㊵

41. The moon is related to the earth as the earth is to —
㊶ Mars ㊷ the sun ㊸ clouds ㊹ stars ㊺ the u

42. The opposite of sorrow is —
㊻ fun ㊼ success ㊽ joy ㊾ prosperity ㊿ hope

43. If the first two statements are true, the third is (?).
Frank is older than George. James is older than Frank.
George is younger than James.

D14

⑥⑧ approximate ⑥⑨ conditional ⑦⓪ constitutional. . . .

oil ⑦④ ate ⑦⑤ hat. . . . . .

s cost?
2s. 11d. ⑦⑨ 3s. $8\frac{1}{2}$d. ⑧⓪ 1s. $5\frac{1}{2}$d. . . . . .

nearest the beginning?
1
) 6 ⑧⑤ 5. . . . . .

⑧⑥ ⑧⑦ ⑧⑧ ⑧⑨ . . . . . .

rd is (?).
itizens are doctors.

ot certain. . . . . .

e other four?
in ⑨ quick ⑩ speedy. . . . . .

o be —
⑬ conceited ⑭ untruthful ⑮ prejudiced. . . . . .

sentence,
e end?
desirable and are
e ⑳ d. . . . . .

les when washed,
rinking?
㉔ 46 ㉕ $45\frac{1}{2}$. . . . . .

three?
n house ㉘ come home ㉙ work problems. . . . . .

at a mirror on the opposite wall,
directly?
㉝ MAMA ㉞ DEED ㉟ TOOT . . . . . .

e just as many letters between them in
vo letters comes first in the alphabet?
㊴ O ㊵ R. . . . . .

curve ㊹ point ㊺ string. . . . . .

⑩ revision . . . . . .

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44. If 2½ yards of cloth cost 1s. 3d., what will 10 yards cos
⑤⑥ 5s. ⑤⑦ 3s. 1½d. ⑤⑧ 1s. 8
45. Congest means to bring together, condole means to griev
Therefore con means — ⑥⑪ to bring ⑥⑫ together

64. A statement the meaning of which is not definite is said to be —
(66) **erroneous** (67) **doubtful** (68) **ambiguous** (69) **distorted** (70) **hypothetical**

65. Evolution is to revolution as crawl is to —
(71) **baby** (72) **floor** (73) **stand** (74) **run** (75) **hands and knees**

66. Coming is to came as now is to —
(76) **to-day** (77) **some time** (78) **to-morrow** (79) **before now** (80) **hereafter**

67. One number is wrong in the following series.
1 2 4 8 16 32 64 96
What should that number be?
(1) **3** (2) **6** (3) **12** (4) **48** (5) **128**

68. If George can ride a bicycle 60 feet while Frank runs 40 feet, how many feet can George ride while Frank runs 30 feet?
(6) **50** (7) **10** (8) **45** (9) **20** (10) **70**

69. What letter is the fourth letter to the left of the letter which is midway between D and I in the word REPRODUCTION?
(11) **C** (12) **R** (13) **O** (14) **N** (15) **D**

70. Which of the five things following is most like these three: ivory, snow, and milk?
(16) **butter** (17) **rain** (18) **cold** (19) **cotton** (20) **water**

71. A hotel serves a mixture of 2 parts cream and 3 parts milk.
How many pints of milk will it take to make 25 pints of the mixture?
(21) **25** (22) **16⅔** (23) **15** (24) **12½** (25) **10**

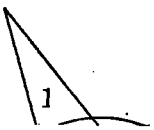
72. A man who spends his money lavishly for non-essentials is considered to be —
(26) **fortunate** (27) **thrifty** (28) **extravagant** (29) **generous** (30) **economical**

73. This  is to this  as this  is to — (31)  (32)  (33)  (34) 

74. If the first two statements following are true, the third is (?).
One cannot become a good violinist without much practice.
Charles practises much on the violin. Charles will become a good violinist.
(36) **true** (37) **false** (38) **not certain**

75. Which of these expressions is most unlike the other three?
(41) **small to tiny** (42) **pretty to beautiful** (43) **warm to hot** (44) **excellent to good**

76. If the words below were rearranged to make a good sentence, the *fifth* word in the sentence would begin with what letter?
life friends valuable to The make asset in a is ability
(46) **l** (47) **f** (48) **v** (49) **t** (50) **a**

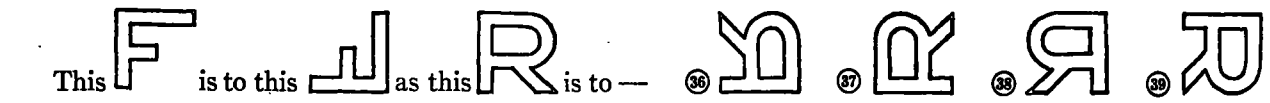


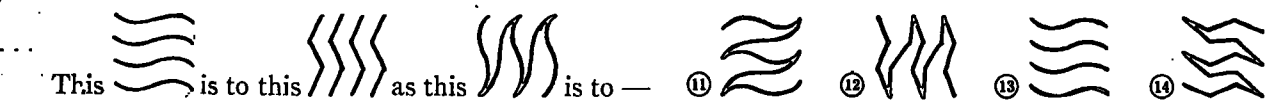
77. What number is in the space that is in the rectangle and in the triangle but not in the circle?
(51) **1** (52) **2** (53) **3** (54) **4** (55) **5**

(Go right on to the next page.)

21. If 10 boxes full of apples weigh 400 pounds, and each box when empty weighs 4 pounds, how many pounds do all the apples weigh?
(21) **40** (22) **360** (23) **396** (24) **400** (25) **404**

1. The opposite of hate is —
   ① enemy ② fear ③ love ④ friend ⑤ joy
2. If 2 pencils cost 5 pence, how many pencils can be bought for 50 pence?
   ⑥ 100 ⑦ 10 ⑧ 20 ⑨ 25 ⑩ 5
3. A dog does not always have —
   ⑪ eyes ⑫ bones ⑬ a nose ⑭ a collar ⑮ lungs
4. A recollection that is indefinite and uncertain may be said to be —
   ⑯ forgotten ⑰ secure ⑱ vague ⑲ imminent ⑳ fond
5. Which of these words would come first in the dictionary?
   ㉑ more ㉒ pile ㉓ mist ㉔ pick ㉕ mine
6. A fox most resembles a —
   ㉖ pig ㉗ goat ㉘ wolf ㉙ tiger ㉚ cat
7. Gold is more costly than silver because it is —
   ㉛ heavier ㉜ scarcer ㉝ yellower ㉞ harder ㉟ prettier
8. The first drawing below is related to the second in the same way that the third one is to one of the remaining four. Which one?



9. A radio is related to a telephone in the same way that (?) is to a railway train
   ㊶ a highway ㊷ an aeroplane ㊸ petrol ㊹ speed ㊺ noise
10. The opposite of wasteful is —
    ㊻ wealthy ㊼ quiet ㊽ stingy ㊾ economical ㊿ extravagant
11. A debate always involves —
    (51) an audience (52) judges (53) a prize (54) a controversy (55) an auditorium
12. A party consisted of a man and his wife, his two sons and their wives, and four children in each son's family How many were there in the party?
    (56) 7 (57) 8 (58) 12 (59) 13 (60) 14
13. One number is wrong in the following series.
    1 5 2 6 3 7 4 9 5 9
    What should that number be?
    (61) 9 (62) 7 (63) 8 (64) 10 (65) 5
14. A school is most likely to have —
    (66) maps (67) books (68) a janitor (69) a teacher (70) a blackboard
15. What letter in the word WASHINGTON is the same number in the word (counting from the beginning) as it is in the alphabet?
    (71) A (72) N (73) G (74) T (75) O
16. Which word makes the truest sentence? Fathers are (?) wiser than their sons.
    (76) always (77) usually (78) much (79) rarely (80) never
17. Four of these five things are alike in some way. Which one is not like the other four?
    ① nut ② turnip ③ rose ④ apple ⑤ potatoes
18. The opposite of frequently is —
    ⑥ occasionally ⑦ seldom ⑧ never ⑨ periodically ⑩ often
19. 

At a dinner there is always

ANSWER SHEET

Otis Quick-Scoring : Gamma : A

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66 76 77 78 79 80
67 1 2 3 4 5
68 6 7 8 9 10
69 11 12 13 14 15
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55 21 22 23 24 25
56 26 27 28 29
57 31 32 33 34 35
58 36 37 38 39 40
59 41 42 43 44 45
60 46 47 48 49 50
61 51 52 53 54

Page 4

22 26 27 28 29 30
23 31 32 33 34 35
24 36 37 38 39 40
25 41 42 43
26 46 47 48 49 50
27 51 52 53 54 55
28 56 57 58 59 60
29 61 62 63 64 65
30 66 67 68 69 70
31 71 72 73 74 75
32 76 77 78 79 80
33 1 2 3 4
34 6 7 8 9 10
35 11 12 13 14
36 16 17 18 19 20
37 21 22 23
38 26 27 28 29 30
39 31 32 33 34 35
40 36 37 38 39 40
41 41 42 43 44 45
42 46 47 48 49 50
51 52 53

Page 3

1 1 2 3 4 5
2 6 7 8 9 10
3 11 12 13 14 15
4 16 17 18 19 20
5 21 22 23 24 25
6 26 27 28 29 30
7 31 32 33 34 35
8 36 37 38 39
9 41 42 43 44 45
10 46 47 48 49 50
11 51 52 53 54 55
12 56 57 58 59 60
13 61 62 63 64 65
14 66 67 68 69 70
15 71 72 73 74 7
16 76 77 78 79 8
17 1 2 3 4
18 6 7 8 9 1
19 11 12 13 14
16 17 18 19 20

3,5 mins

D 13

OTIS QUICK-SCORING MENTAL ABILITY TESTS

By ARTHUR S. OTIS, PH.D.

Formerly Development Specialist with Advisory Board, General Staff, United States War Department

Gamma

A

GAMMA TEST: FORM A

For Ages 15-18

Score.....

Read this page. Do what it tells you to do.

Do not open this booklet, or turn it over, until you are told to do so.
Fill in these blanks, giving your name, age, birthday, etc. Write plainly.

Name..... Age last birthday .....years
First name, initial, and last name

Birthday..... Teacher..... Date.....19.....
Month Day

Class.....School.....

This is a test to see how well you can think. It contains questions of different kinds. Here are three sample questions. Five answers are given under each question. Read each question and decide which of the five answers below it is the right answer.

Sample a: Which one of the five things below is soft?

① **glass** ② **stone** ③ **cotton** ④ **iron** ⑤ **ice**.....

1 2 3 4 5
| | | ▮ | | |

The right answer, of course, is *cotton;* so the word *cotton* is underlined. And the word *cotton* is No. 3; so a heavy mark has been put in the space under the 3 at the right. This is the way you are to answer the questions.

Try the next sample question yourself. Do not write the answer; just draw a line under it and then put a heavy mark in the space under the right number.

Sample b: A robin is a kind of —

⑥ **plant** ⑦ **bird** ⑧ **worm** ⑨ **fish** ⑩ **flower**....

6 7 8 9 10
| | | | | |

The answer is *bird;* so you should have drawn a line under the word *bird*, and *bird* is No. 7; so you should have put a heavy mark in the space under the 7. Try this one:

Sample c: Which one of the five numbers below is larger than 55?

⑪ **53** ⑫ **48** ⑬ **29** ⑭ **57** ⑮ **16**.....

11 12 13 14 15
| | | | | |

The answer, of course, is 57; so you should have drawn a line under 57, and that is No. 14; so you should have put a heavy mark in the space under the 14.

The test contains 80 questions. You are not expected to be able to answer all of them, but do the best

21 22 23 24 | 41 42 43 44 45 | 61 62 63 64 65 66 67 68 69 70 | 80

Attempt THREE WORDS ONLY from each set.

Set 21.

riable condenser.....

ailer.....

eated joint.....

ch.....

ky Bumblebee.....

ker.....

Set 22.

ck.....

e iron.....

l.....

plug.....

rmark.....

ection lens.....

Set 23.

dant.....

mate.....

my Award.....

rby Wet.....

g.....

aire.....

Set 24.

.....

AME ..... AGE .....

ORM .....

Below are sets of six words or names. Beginning with set 1, hrough the six words or names and then select three only. Write ou know about each of these three in the space provided. You ma drawing or sketch wherever you think it will help to make your

Attempt THREE WORDS ONLY from each set.

Set 1.

1. Ground sheet.....
2. Lexicon.....
3. Beech.....
4. Artificial respiration.....
5. No ball.....
6. Swallow.....

Set 2.

. The Honorable Phoebe.....
. Dummy hand.....
Watermark.....
Jackie Drake.....
Check.....

Or

P
F
I

.....
.....
.....
.....
.....

1. 1.
2. 2.
3 3.
4 4.
5 5.
6. 6.

1. C
2. P
3. Sp
4. Ra
5. Wa
6. Pr

1. Att
2. Sta
3. Aca
4. Weth
5. Moun
6. Soli

1. Flex

APPENDIX D

The Final Battery of Tests

Dihedral angle	Inclination of the wings of an aeroplane
Dicky Bumblebee	From comic paper
Castling	Move in chess
Barry Fitzgerald	Film star
Projection lens	In a cinematograph
Briar	Wild rose bush
The Honourable Phoebe	'Waterlogged Spa'
Stalemate	Term in chess
Rip Magee	From comic paper
Perennial	Plant which flowers each year
Sir Adrian Boult	Orchestra conductor
Nick Smith	From comic paper
Trump suit	Term in cards
Sophie Tuckshop	'Itma'
Size	For sealing plaster surfaces.
Corner kick	Used in football
Lexicon	Spelling game
J.Arthur Rank	Film magnate
Ground sheet	Rubber sheet used when camping
Zachary Scott	Film star
Draughts	Game played on chequered board
Thomas Beecham	Orchestra conductor
Bergan	Type of rucksack
Priming paint	Paint appied to a new surface
Colonel Chinstrap	'Itma'