SHORT TITLE

COGNITIVE BEHAVIOURAL PRODUCTS OF THE S.I. MODEL

by

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ABSTRACT

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Title Cognitive Behavioural Products of the Structure of Intellect Model: Some preliminary considerations.

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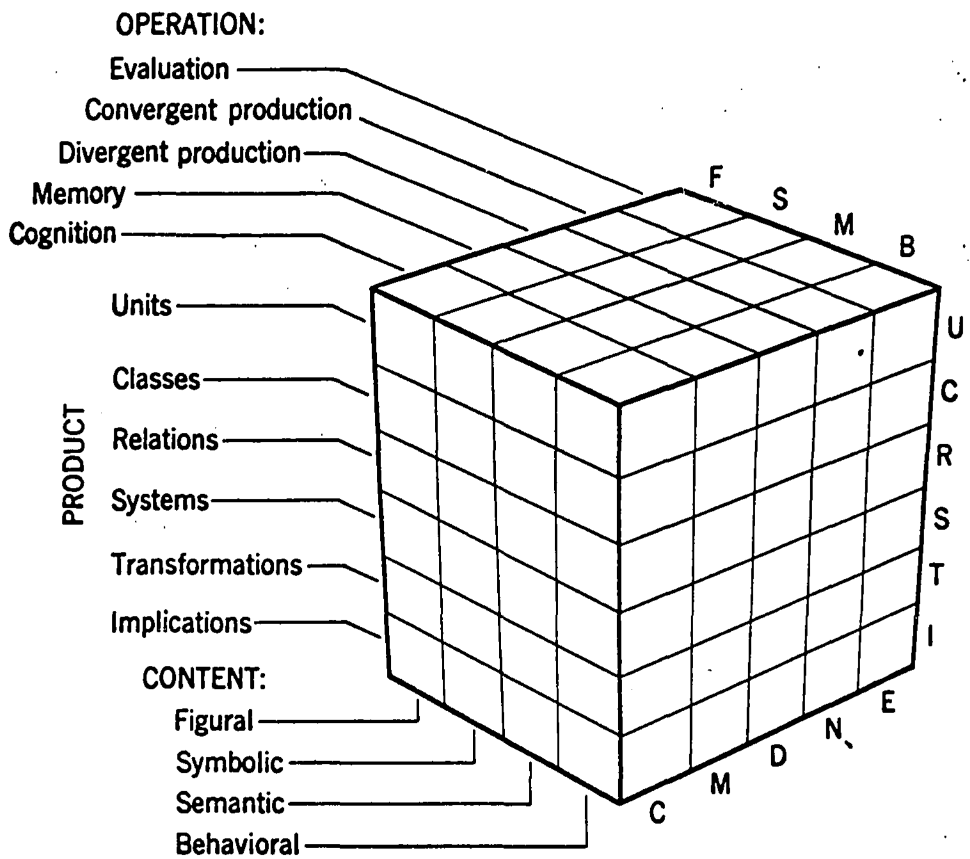
Summary

Guilford established a model of the structure of intellect, in terms of operations, contents and products. The behavioural content category is a recently added dimension.

Support for the construct of cognitive behavioural abilities has received confirmatory evidence largely from work on eleventh grade students. The present study attempts to verify by means of six of Guilford's experimental tests whether the same dimension exists amongst eighth grade students.

It was concluded that there was evidence for a cognitive behavioural dimension at the eighth grade level, although the evidence was less distinctive than that at the eleventh grade level.

THE STRUCTURE OF INTELLECT MODEL



COGNITIVE BEHAVIOURAL PRODUCTS OF THE STRUCTURE OF INTELLECT MODEL : SOME PRELIMINARY CONSIDERATIONS

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CHAPTER I

INTRODUCTION

The structure of intellect theory was formulated by Guilford in the early 1950's, and the behavioural content category was added in 1958. This category was suggested on a purely hypothetical basis to account for statements by E. L. Thorndike (1920) (and others) on "social intelligence". Spearman (1927) was speaking about the same aptitude area under the heading of "psychological relations". Guilford hypothesized not one social intelligence, but 30 different factors of behavioural (social) ability.

While some other content areas in the structure of intellect have been amply supported by research evidence, research in the area of behavioural content is very new. Guilford (1967) quotes only the factor - analytic research report by O'Sullivan, Guilford and de Mille (1965) in support of his theory of behavioural cognition abilities. In this analysis, it was established that the factorial domain of "behavioural cognition" included the six product areas predicted by the structure of intellect :

(1) Cognition of behavioural units (CBU)

(2) Cognition of behavioural classes (CBC)

(3) Cognition of behavioural relations (CBR)

(4) Cognition of behavioural systems (CBS)

(5) Cognition of behavioural transformations (CBT)

(6) Cognition of behavioural implications. (CBI)

In the context of the structure of intellect model, behavioural cognition is defined as the ability to understand the thoughts, feelings, intentions and attitudes (psychological dispositions) of other people. The ability to judge others has often been considered as a personality trait, and the behavioural cognition factors may be regarded as roughly corresponding to the domain termed person perception, empathy or social awareness by other investigators. But, as Bronfenbrenner, Harding and Gallwey (1958) have clearly pointed out, comprehension of the generalized other, e.g. the average college sophomore, is a social sensitivity distinct from that involved in knowing the feelings of a given individual. O'Sullivan et al's (1965) study was limited to an investigation of the understanding of individual others, not average others. Hence, the label of "social" has been rejected in order to avoid misleading and broader connotations.

It is the aim of the present study to provide further evidence for the validation of the construct of cognitive behavioural products. The existence of the cognitive behavioural factors was demonstrated by O'Sullivan et al (1965) in a population of 240 high school students of the eleventh grade. This, however, is hardly sufficient to establish the construct on a firm foundation, and O'Sullivan has already suggested that the cognitive behavioural factors be demonstrated with a different, less homogeneous population. It is necessary to validate the construct on other age groups and on other kinds of population. The present study will concentrate on a younger population of eighth graders. For the purpose of their study, O'Sullivan et al constructed tests employing photographs, drawings and other less than real life depictions of intentional or emotional states, and tape recorded words. Each of the six cognitive behavioural factors was defined in the analysis by at least three tests having different stimuli. It is neither possible nor desirable to replicate fully their work with a younger population. The present study, with volunteers as examinees, was able to make use of the experimental version of Guilford, O'Sullivan and de Mille, released specifically for research purpose, and under conditions of security which preclude the publishing of the tests in full, even in a thesis. Therefore, the present study is limited largely to an investigation of the four categories of cognitive behavioural classes, cognitive behavioural systems, cognitive behavioural transformations and cognitive behavioural implications.

The development of the structure of intellect model will be traced briefly through the writings of Spearman, Kelley, Thurstone, Burt, Vernon and Guilford. Particular attention will be given to Guilford's model on which the present study is based. The ideas leading to the evolution of the most recently added hypothesis about the cognitive behavioural products are then reviewed.

To the extent that the ability to understand and to judge accurately such behavioural characteristics as the abilities, action tendencies, motives and emotions, of others is important in an effective teaching situation, a person who possesses an acute understanding of the behavioural characteristics of others should be able to achieve greater success as a teacher. If the hypotheses concerning cognitive behavioural products can be substantiated it will then become possible to consider the implications for teacher selection and teacher training.

The study will be largely factor analytic though it will include item analysis procedures and the derivation of the usual constants. Reference tests will be selected for inclusion in the matrix of correlations for factor analysis. No oblique rotations will be attempted since these could not confirm a solution derived by Guilford's orthogonal rotations, nor will it be possible to use the more recent method of target rotation which Guilford has utilised following Cliff (1964).

CHAPTER II

THE DEVELOPMENT OF THE STRUCTURE OF INTELLECT MODEL

It is necessary in this study to evaluate critically the evolution of ideas on the structure of human ability, and to examine the structure of intellect as proposed by Guilford.

The outcomes of early investigations on the nature of human intelligence were far from being in agreement, and intelligence became a word with numerous meanings. Spearman's work marked a big step forward. In an epoch-making paper in 1904, he made an inquiry into the relation between Sensory Discrimination tests and estimates of intelligence. His conclusion was that all branches of intellectual activity had in common one fundamental function or group of functions, whereas the remaining or specific elements of the activity seemed in every case to be wholly different from that in all the others. Further study of the correspondence between the various branches of school study such as Classics, French, English and Mathematics yielded a hierarchical pattern of intercorrelations. This led him to the famous argument for the "Hierarchy of the Specific intelligences". In his book, "The abilities of man" (1927), Spearman presented, in addition to his own work to which he had devoted his energies for many years, the work of his students. By using a method of analysis of correlation, he examined the validity of various theories of intelligence and showed that neither the anarchic nor the monarchic nor oligarchic theories of the mind accorded with facts. He offered what he thought was a more satisfactory explanation of human intelligence by putting forth the simplest possible factor model. In equation form, he held that :

$$Z_{ij} = a_{ig} \cdot Z_{ig} + a_{js} \cdot Z_{is}.$$

Where Z_{ij} = Standard score made by individual I in test J.

a_{ig} = factor loading of test J for factor g.

Z_{ig} = score for individual I on scale of factor g.

Z_{is} = score for individual I for specific component in test, or factor s.

a_{js} = factor loading of test J for factor s.

What most people understand from the above equation is merely that the standard score made by an individual in a test can be accounted for by the two components of intelligence ; the g factor and the specific factors. They are generally unaware of the relationship between the components of intelligence and the form of the tests designed to measure them. An individual entering into a testing situation may be presumed to bring with him a certain amount of g and of s. A test, in order to measure the g factor in this individual, must itself have a significant loading on g. Hence, the standard score made by an individual I in a test J can be accounted for by the sum of the product of the factor loading of test J for factor g and score for individual I on factor g, and the product of factor loading of test J for s and score for individual I on s. Spearman developed the tetrad difference technique of proving that no significant factors other than g and specifies were present. Using the Occam's Razor argument he adhered to his belief in the existence of a g factor. Eventually, however, Spearman had to admit that something in addition to g is helping to produce correlation coefficients, and hence he recognised the existence of group factors as propounded by Kelley (1928). Group factors are factors which occur in more than one, but less than all of any given set of abilities.

Kelley (1928) showed that a positive correlation could be explained by the presence of a factor other than Spearman's "g". He demonstrated that heterogeneity of the test population due to maturity, sex or racial origin, could cause a correlation. He further attempted to demonstrate that if correlations existed after the removal of the effects of heterogeneity, it still did not follow that only one general factor was required to explain the correlation.

He then set out a series of prepositions to demonstrate the mathematical necessities which would follow from the assumption of various combinations of general and specific factors for two, three, four and five variables. He was therefore able to demonstrate the necessary existence of group factors.

Thurstone (1932) went beyond what Spearman and Kelley did. He did not start off by assuming the existence of a g factor. Instead, he designed his experimental procedures to tackle the question of how many factors were represented in a set of tasks. Examination of a tetrad difference in determinant notation led to the recognition of the tetrad as a particular kind of matrix. The rank of the matrix would indicate the number of factors required of its solution. This was both an improvement upon Kelley's rather laborious mathematics, and a recognition that Spearman's theory of g and s was always true if the tetrad formula held, and might be true for matrices of higher order, but that demonstration would be required for each case separately. Thurstone termed the factors that he isolated as multiple factors. The technique he used to demonstrate his Multiple Factor Theory was the "centroid method", in which he extracted factors using an orthogonal reference frame and graphic rotations of axes. He adopted as his criteria, the conditions of "simple structure" and "positive manifold". The details of extraction procedures can be found in several texts (Guilford 1954, Fruchter 1954, Harman 1960). Of the factors which he found, a limited number of them would explain the greatest part of the variance. These factors he termed the primary factors of mental ability or more usually primary mental abilities. These were Perceptual speed (P), Numerical (N), Verbal (V), Word Fluency (W), Memory (M), Spatial (S) and Reasoning (R). It was Thurstone's principle that once several hypotheses were made about postulated factors, steps should be taken to design new tests which might be crucially differentiating between the several hypotheses. In the Psychometric Laboratory at Chicago, he worked closely with his wife Thelma Gwinn Thurstone in building a battery of experimental tests for practical use in estimating primary abilities. The experimental tests were short with low reliabilities so that the battery would cover the range of factors in existing psychological tests and so that each factor would be overdetermined with a large number of tests. Thurstone noted that once the general nature of the more important factors was indicated by group procedures, it would then be necessary to improve the tests by increasing the saturation of the factor that each test was expected to measure and by decreasing the saturations of other factors, in other words, to reduce the complexity of the tests in order to make them relatively pure measures of the primary abilities.

In a stock-taking paper (1940), Guilford pointed out that the impartial investigator of human ability should look for a procedure that would permit the true factor pattern to emerge, no matter what it might be like, with g or without. He added that past investigators had confined themselves too much within the horizon of the tests then available. He called for the invention of tests in new areas in order to reveal all the important factors in human ability. A useful suggestion put forth by Guilford concerning the identification of abilities underlying a test, was that the three aspects of the test (1) material, (2) formal, and (3) functional, should be taken into consideration. The material of the test might be words or closely related symbols; it might be figures, numbers or pictures of objects. In the mode of presentation, the items might be in the form of analogies, paired associates or series; others might require an assembly of elements or the completion of a whole. The functional aspect of a test had to do with what it made the testee actually do. The first two aspects were often recognised but the third was frequently overlooked. In the later stages of World War II, Guilford, working in the United States Army Air Forces Aviation Psychology Research Program, developed a large number of printed classification tests (1947). In the construction of the tests, efforts had been made to achieve better and more unique measures of certain primary abilities, to achieve a better understanding of those abilities, and to determine whether other hypothesized, factors would be found.

Three major books (Thomson 1939, Thurstone 1947, Burt 1949) summarized the work on the analysis of human abilities in order to see better just at what stage researchers had arrived and what some of the next steps should be. It was a generally recognised problem that as the newly discovered factors increased in number, there was a need for putting them into some kind of logical inter-relationship. Burt (1949) was one of the first to attempt this kind of exercise. He conceived of a hierarchical type of model which applied to the whole of the human mind, with the first major dichotomy between "intellectual" characteristics or g, and "practical" characteristics, with successive dichotomizations at different mental levels. The various levels of bifurcation he identified as "relations" at the highest or top-most level, "associations" at the second level, "perception" at the third and "sensation" at the fourth or lowest level. Vernon's conception of intellectual abilities too, took the form of a hierarchical model (1950). Under g were two main group factors, v : ed for verbal-education on the one hand, and k : m on the other. The former, v : ed, subdivided into verbal and numerical, while the latter k : m (known as "practical" in Burt's model) subdivided three ways into spatial ability, manual ability and mechanical information. Beyond these, were specific factors, each of very narrow scope and considered by Vernon to be of little importance. Burt's hierarchical concept was based on the physiological work of Sherrington (1906) on the integrative action of the nervous system, whilst Vernon's concept arose directly from the large scale testing in the Armed Forces of England in 1940-45, where the results of the tests used tended to reflect the educational backgrounds of English soldiers.

J. W. French's (1951) work was of a different kind. He made a survey of all the factors that had consistently been found by the various factorists, and he produced a kit of reference tests. The technique of using reference tests to find out the existence of any new factors in addition to giving further information on existing factors, has been adopted by many investigators including O'Sullivan et al (1965). The same method will be employed in the present study to demonstrate the existence of the cognitive behavioural factors among the eighth graders.

Guilford's approach to the problem of organizing the intellectual factors into a system was a more sophisticated one. His experimental population consisted of high-level personnel in the United States Air Force. Factorists since Kelley's time have recognised that the correlated population should be relatively homogeneous with respect to such variables as age, sex, race, cultural background, formal education and specific training. Moreover, Guilford believed that the scope of human intellect could be more fully explored in a population of high-level personnel. Guilford questioned the validity of Spearman's "g". He had indicated (1941) that any genuine zero correlation between pairs of intellectual tests would be sufficient to disprove the existence of a universal factor like g. As a test of the argument advanced by Spearman's staunch supporters that g was rotated out of existence by rotation of axes as in Thurstone's Multiple-factor procedures, he invented two fictitious factor matrices, each with a g factor, a factor with all non-zero loadings. Without awareness of the factor patterns, students in training were given the two correlation matrices for analysis, using Thurstone's centroid method with rotation of axes. In every case the g factor was found, indicating that in the normal processes of rotation a g factor could still be found if it was in fact present. Guilford doubted the applicability of a hierarchical model of human intelligence, such as that of Burt and Vernon, in which the idea of a g factor was the key concept. Factor analyses of intellectual tests in the United States, whilst failing to report a g factor, had revealed a tendency for each factor to be limited to a small number of tests in any analysis. Furthermore, there had been little or no tendency to find a few broader group factors represented each by a large number of tests, and a large number of narrow group factors. The factors discovered appeared to be about equally general in this respect, being strongly represented by small numbers and relatively equal numbers of tests. Another consideration was that many factors possessed parallel properties. For example, if one were to collect half a dozen verbal factors in one set and a collection of half a dozen non-verbal factors in another, the factors in the two sets could be paired off in a meaningful manner. The psychological operation was the same in each pair, only the content of the test items was different, yet the members of each pair would come out of an analysis as separate factors. The results of extensive factor-analyses had disproved the belief that the same ability was involved regardless of the kind of information dealt with.

By 1956, Guilford felt that enough of the intellectual factors were known to suggest strongly the outlines of a system. He listed all the factors reported in French's summary of factors appearing in 1951 and those reported since that time. Of approximately 40 such factors, 7 were memory factors and the remaining ones were thinking factors. In fact, the term "intellect" as then applied, could be defined as the system of memory and thinking factors, functions or processes. Each investigation started by hypothesizing that certain unitary abilities existed and that they possessed certain properties. Psychological tests were then selected, adapted and constructed for each hypothesized factor in order that the results could show whether or not the factor hypothesized existed, and whether or not it possessed the properties as suggested. Classified on the basis of kinds of operation, the memory factors were grouped under one category while the thinking factors were categorized under the general headings of cognition, convergent thinking, divergent thinking and evaluation. Examination of the factors in the cognition category revealed that for each factor of a certain kind found in verbal tests, there seemed to be a "mate" found in tests composed of figures or designs, and also a parallel factor found in tests composed of letters or symbols. And, if the factors of intellect were classified on the basis of the product of the operation, such as relation, class or pattern, it seemed logical that for each combination of content and thing discovered, there was a potential factor. The result of Guilford's analysis was a matrix of factors in each operation area. The factors in each of the five operation categories were arranged according to two major principles. The first major principle pertained to the kinds of content ; figural, structural and conceptual. In the cognition, convergent thinking and divergent thinking categories, the second principle of classification cutting across the content principle, pertained to the kinds of things discovered or produced. In the memory category, the second principle pertained to the kinds of things remembered. The vacant cells in the matrices suggested hypotheses for undiscovered factors.

It should be noted in passing that Guilford's ideas about convergent and divergent thinking arose from his concern over the dimension of creativity with which he dealt in the mid 1950's.

Later developments have resulted in a single, cubical model in which kinds of products are parallel for all combinations of contents and operations, kinds of contents are parallel for all combinations of products and operations, and kinds of operations are parallel for all combinations of contents and products. Along the first dimension of the model are the five kinds of psychological operations; cognition, memory, divergent production, convergent production and evaluation. Along the second dimension are the three kinds of content; figural, symbolic and semantic. The six product categories which are placed along the third dimension are units, classes, relations, systems, transformations and implications. Each factor in the structure of intellect occupies one cell in the model and can be so located by specifying its operation, content and product. (Guilford 1959).

The structure of intellect model is by no means totally unrelated to previous theories and models. For instance, Spearman's "fundaments" are structure of intellect relations.

Spearman's concept of "eduction of relations" is equivalent to the cognition of relations and his concept of "eduction of correlates" belongs in the structure of intellect category of convergent production. Where he thought that these were the two major operations most characteristic of g, however, the structure of intellect model presents three distinct abilities for "educing" or cognizing relations, one for each kind of eontent; figural, symbolic and semantic. To Thurstone as well asto Spearman, intelligence seemed to be first and foremost a cognitive function, by Spearman to be accounted for by a single all-pervasive factor, by Thurstone by a number of factors. But in the structure of intellect model, cognitive abilities are located in a limited number of cells. Burt's first major bifurcation and Vernon's first major bifurcation between v : ed and k : m major group factors are in a way parallel to the distinction between semantic and figural categories of information. Vernon's further bifurcation under v : ed between verbal and numerical is parallel to the structure of intellect distinction between semantic and symbolic information. Comparisons between previous models of intellectual abilities and the structure of intellect model indicate the narrowness of the former, and the rich possibilities that the hypothesized factors in the model offer for more complete and more meaningful assessments of the intellect of persons. Since the formulation of the structure of intellect model, a number of factor analyses have been directed toward testing abilities hypothesized in the model which previous factor analyses have not yet demonstrated. Additional factors have been found and located within the system.

In 1958, Guilford added the behavioural content category to his structure of intellect model to account for statements made by E. L. Thorndike (1920) and others on "social intelligence". Spearman (1927) was speaking about the same aptitude area under the heading of "psychological relations". Behavioural cognition is but one of the five behavioural operations hypothesized. While behavioural cognition stresses the "understanding" aspect of social intelligence, behavioural convergent production and behavioural divergent production are concerned with the "doing" aspect. Apart from these three behavioural operations, there are the behavioural memory and the behavioural evaluation operations. The theory suggests that information regarding behaviour is also in the form of the six kinds of products that apply elsewhere in the structure of intellect, including units, classes, relations, systems, transformations and implications. Hence, 30 abilities in the behavioural product area are hypothesized.

Having looked at the internal consistency of the construct of the structure of intellect model, one should look at the most recently evolved hypothesis of cognitive behavioural products. The following chapter will be devoted to this aspect.

CHAPTER III

THE DEVELOPMENT OF IDEAS ABOUT COGNITIVE BEHAVIOURAL PRODUCTS

The behavioural content area is the most recently evolved category in Guilford's structure of intellect model. Hence, compared with other areas in the S. I model, it is the least supported category.

The study of cognitive behavioural abilities is rooted in much of the research work done on the expressions of the human face. Sir Charles Bell, whose "Essay on the Anatomy of Expression" was first published in 1806, was the first to attempt a scientific study of emotions in terms of the muscles which produced the various facial expressions. But it was really Darwin who first pointed the way for systematic study of the ability of people to judge facial expressions by using photographs. This mode of approach was taken up by Feleky (1914) who posed for various expressions and offered for judgment the photographs thus obtained, "to show what emotional states certain facial expressions do signify". She found that certain expressions were readily identified, while in the case of others, confusions existed. Langfeld (1918), employing the pictures illustrated in Rudolph's book in an investigation on the methods used by the subjects in judging emotional expressions, concluded that suggestion could influence the formation of the subjects' judgments.

The method of presenting photographs was used to a large extent during the following decade. Ruckmick (1921) experimented with pictures of a female face in the same way as Feleky, and attempted to determine which of the facial features, the eye or the mouth, tended to give the best clues for interpretation. He found that next to the whole face, the lower half of the face gave the best cues for interpretation, then in order came the eyes, the lower half, the mouth and finally the nose and the lines about the nose. Landis (1924) designed an experiment for the purpose of recording and analyzing facial expressions of various persons who were subjected to a controlled series of situations of a more or less emotional nature. Such researches were extended by Frois-Wittmann (1930) who used a new and extensive series of drawings and photographs in which he posed as a model. Seventy-two of the Frois-Wittmann portraits were illustrated in the article by Hulin and Katz (1935). Frois-Wittmann studied the inter-relationships of the judged expressions and also examined what in the muscular involvements of the faces made possible the judged expressions obtained on them.

Working in another direction, Gates (1923) studied group differences in ability to name facial expressions by obtaining judgments from children of various ages, thus determining at what age the expressions became recognised.

Boring and Titchener (1923) adapted Piderit's "Geometry of Expression" for demonstrational purposes by using an "articulated" profile. The model consisted of the profile of a head, with various brows, eyes, noses and mouths that could be fitted into place after the manner of a puzzle picture. By means of this model, it was possible to show what each of these features contributed to the total expression of the face, and also to synthetize a large variety of expressions by an interchange of a number of mouths, eyes, brows and noses. However, the profile had certain limitations, in that it did not make it possible to produce some very important expressions, such as laughing and weeping. In order to supplement the list of total expressions possible with the Boring - Titchener model and to show the facial expressions more completely, Guilford and Wilke (1930) had a new model built based upon the same principles but presenting a view of the full face. Buzby (1924) experimented on six of the typical faces of the Boring and Titchener model, and the results of his analysis showed that the upper part of the face, eye and brow, were more important for correct judgment of facial expression than the mouth. Dunlap (1927) investigated, by means of photographs of male and female subjects, the role, in facial expressions, of the eye and the mouth muscles. The plan of the study involved the cutting of each picture into two parts, cutting horizontally through the bridge of the nose, so that the eyes were on one part, the mouth on the other. In this way, it was possible to make a study of eyes alone, or of mouth alone, and to combine the mouth from one expression with the eyes from another. His results, disagreeing with those of Buzby's, showed that the mouth muscles were predominantly the determining factor.

Interest in speech as an indicator of personal characteristics has increased tremendously since the 30's (Kramer 1963). Generally, judgments of emotion or other personality traits on the basis of vocal cues alone tended to be inaccurate with little agreement either between judges or with a criterion. Eisenberg and Zalowitz (1938) who investigated the problem of judging personality from expressive movement by studying judgments of dominance-feeling from phonograph records of voice, found that judgments were made on the basis of preconceived notions which might or might not correspond to reality. Some English experiments of this nature were reported by Pear (1931). Two tests using vocal stimuli had been constructed by O'Sullivan et al (1965) for the purpose of measuring cognitive behavioural abilities. However, the tests "Inflections" and "Sound Meaning" were found to have low reliabilities, and furthermore they showed no significant loadings on any factor.

One of the earliest occurrence of the term "Social

Intelligence" was found in the writings of E. L. Thorndike (1920) who proposed the idea that there were three kinds of intelligence; mechanical, abstract and social. The first was manifested by the individual's ability to manipulate objects, the second by his ability to work with symbols, and the third by his ability to deal with people. Social intelligence has since then been widely studied as a personality trait, roughly corresponding to the domain of person perception, empathy or social awareness. Ample research evidence is found in a vast collection of personality literature. But, there has been very little precedent in research in the area of social-intellectual abilities using factor-analytical procedures, the kind of investigation that is more directly pertinent to this study.

Schlosberg (1941) suggested a scale for judging facial expressions, which he later amplified (Schlosberg 1952, Schlosberg 1954). Woodworth (1954) also developed such a scale from a careful examination of the distribution of judgments of 100 subjects working with 86 poses. Their work set a trend for a growing interest in the determination and measurement of what had been called empathic ability or social sensitivity. A number of studies were carried out with the aim of providing a measure of "predictive accuracy", that is, the ability of the individual to predict responses of another person, often such specific responses as answers to psychological test items. Dymond (1949) used this method of social-perception assessment to construct a scale for the measurement of empathic ability. Recent attempts had employed a deviational score when the subject tried to predict an associate's response to questionnaire items. The difference between the subject's predictions and the associate's actual responses was taken as an empathy score, the smaller the deviation, the better the empathy score. There were also attempts at controlling similarity, that is, similarity between the subject's predictions and his own responses. This resulted in the development of the projection or the "Assumed Similarity" score (Fiedler 1954). However, Hastorf, Bender and Weintraub (1955) were of the opinion that the "refined empathy score", which was obtained after the raw empathy score was corrected for assumed similarity, was still an unsatisfactory measure of empathic ability.

The area of research which incorporates the same conception of social intelligence as in the present thesis is that concerning the "individual others". Bronfenbrenner, Harding and Gallwey (1958) made a distinction between the ability to make judgments about a generalized other, for example, the average high school student, and the understanding of the feelings of a given individual. Their hypothesis was that different abilities were involved in interpersonal sensitivity and generalized-other sensitivity.

Moss and Hunt had been working for several years on a statistical analysis of tests given in industry, and also tests given in educational institutions with the aim of constructing a more valuable device for measuring this interpersonal sensitivity which they called the "ability to get along with others". The George Washington Social Intelligence Test, prepared by Moss, Hunt and Omwake (1949) consisted of 5 tests, the second of which called for "recognition of mental states of the speaker", the other tests being devised to examine judgment in social situations, memory for names and faces, observation of human behaviour and sense of humour.

The first report on a factor-analysis of social-intelligence was by R. L. Thorndike (1936) who analyzed the sub-tests of the George Washington Social Intelligence Test and also five tests of verbal content. He concluded that a verbal factor would account for most of the variances of the social tests. Woodrow (1939) also factor-analyzed the sub-tests of the same social-intelligence scale in a battery with 47 other tests of very heterogeneous nature, including among others, attention tests, tests of musical ability, spatial measures and sub-tests of a general intelligence test. He extracted ten factors, none saturated with the Social Intelligence Subtests. These sub-tests were found to be loaded on factors defined by verbal or memory variables.

Wedeck (1947) attempted to establish the existence of a "psychological ability" different from verbal ability. By "psychological ability" he meant an "ability to judge correctly the feelings, moods, motivations of individuals". He devised 8 tests for his purpose. Using pictures from paintings by well-known contemporary artists for four tests, and using photographs of popular film actors for the fifth test, he devised social-situational problems for the subjects to solve. The analysis of these tests together with four verbal and three figural tests yielded three factors ; "g", "v" a verbal factor and "ψ" which he identified as a "psychological factor". Hence, he was really the first to report a behavioural cognition factor. However, Spearman in 1927, spoke about an aptitude area which he called "psychological relations". According to him, the essential process involved when a person went beyond his own inner experience to generate thoughts of other persons around him, was one of educing psychological relations. Spearman noted that this ability to perceive and think of other persons could be effectively measured by means of pictorial tests. He further noted that psychological relations also entered into highly abstract verbal tests, as in Analogy tests. The psychological relations tasks showed a correlation additional to that which was due to g , and accordingly Spearman concluded that this was evidence of a special ability "broad enough to merit being tested".

Guilford's earlier version of the structure of intellect model (1956) showed no indication of any factors that might be regarded as social intelligence factors. But, because his aim in the research of human intelligence had always been one of exploring the human mind as fully as possible in order to uncover all the important abilities, he recognised the possibility of the existence of factors involved in understanding the behaviour of others. Hence in 1958, Guilford added the behavioural content category to his structure.of intellect model on a hypothetical basis. Six cognitive behavioural product areas were hypothesized. Thus, he designated previous social-intelligence experiments which concentrated on "predictive accuracy" as studying C B I (cognition of behavioural implication) which was only one of a number of intellectual abilities relevant to the understanding of others. Guilford was of the opinion that the establishment of the hypothesis of cognitive behavioural abilities would have important implications for all those individuals who deal most with other people; teachers, social workers, therapists, politicians and leaders of other kinds.

To the writer's knowledge, the only research that is related to the present study is that by O'Sullivan et al (1965), which was based on the concept of the understanding of individual others. The analysis aimed at identifying and measuring the six cognitive behavioural products as hypothesized by the structure of intellect model. For the purpose of testing, twenty-three experimental tests were constructed by O'Sullivan et al. Because tests using words had failed to define factors of social intelligence in the past, a minimum amount of words were employed in those tests. The stimuli used were photographs, line-drawings, cartoons, silhouettes, stick figures, and tape-recorded sentences, sounds and inflections. The use of such stimuli was based on an assumption that behavioural cognition might be aptly considered as the ability to understand the thoughts, feelings and intentions of other people as manifested in discernible expressional cues such as facial expressions, vocal inflections, postures and gestures. Taft (1955) was among the many who criticised the use of non real-life stimuli in social intelligence research. He claimed that the emotions pictorially portrayed were stereotypic rather than idiosyncratic and that the investigator of social intelligence was more properly concerned with the latter. O'Sullivan, however, expressed her doubts about the significance of the breach between the communicative idiosyncratic expression and its stereotypic counterpart since the one was the basis for the other. No doubt, the ideal environment in which to test for social intelligence, is a real life social situation with real persons, as Thorndike (1920) had pointed out. But, the practical difficulties involved in the construction of a situational test make such a step uneconomical. Moreover, the factor-analytic paradigm would demand a very large sample of examinees and several tests for each factor under investigation. For the sake of economy, O'Sullivan found it necessary to devise her tests using less than life-size stimuli. It should be noted however, that Wedeck's success with drawings and photographs of facial expressions and social situations was encouraging. Sarbin and Hardyck (1955) reported that schizophrenics were inferior to normal persons in reading the behavioural intentions of stick figures. Knapp (1963) found that mental-hospital patients were inferior to unhospitalised individuals in detecting interactional behaviour in silhouette diads. Since tests using stick figures and silhouettes can discriminate between two groups assumed to be different in social cognitive abilities, the same may be expected of photographs and drawings which are even less removed from real life than stick figures and silhouettes.

Three approaches were used by O'Sullivan et al in their test construction work. The strategy used most often was to construct a behavioural-cognition test by analogy with an existing structure of intellect test in another content area. For example, in a measure of CMU (cognition of semantic units), the examinee was to indicate understanding of the meaning of the given word by choosing, from among several alternatives, the one word that means about the same thing. In devising a test of CBU (cognition of behavioural units) the same test format was used, but with stimuli appropriate to the behavioural content area. As the test constructors themselves had recognised, in adhering too closely to a test-construction paradigm that only paralleled tests defininhg other factors, some other relevant abilities, if any, would be prevented from emerging. The second method of test construction was also firmly rooted in the structure of intellect theory. Each factor in the model has a trigram symbol that stands for its unique combination of operation, content, and product, symbolized in that order. A test could be constructed on the basis of the nature of the factor as indicated by the trigram. For example, CBR (cognition of behavioural relations) means the ability to understand social relationships. A suitable test of CBR might be one that require the comprehension of a variety of diadic relationships. The third strategy of test construction was to first conceptualize behaviour that was socially intelligent in a context other than that of the structure of intellect, and then to fit such behaviour into a test format consonant with the model. An example of this third approach was a test of CBT (cognition of behavioural transformation) called "Who Said It"? which was an attempt to define humour as a behavioural ability.

In choosing the reference factors from which to distinguish the hypothesized behavioural-cognition dimensions, two strategies were used. The first one was to hypothesize what non-behavioural abilities might be assessed by the experimental tests. Examples of reference tests chosen on this basis were measures of NMU, concept naming; NMS, semantic ordering DMU, ideational fluency; DMT, originality; CFU, speed of figural closure; CFR, comprehension of figural relations; and NFT, figural redefinition. The second method of selecting reference factors was dictated by the need to demonstrate that the six behavioural-cognition factors were factorially independent of other structure of intellect factors having two parameters in common with them. On this basis, marker tests for the reference factors of CMU, verbal comprehension; CMC, verbal classification; CMR, verbal relations; and CMI, conceptual foresight or sensitivity to problems, were selected.

The results of the study by O'Sullivan et al confined to eleventh grade students established the existence of the six separate cognitive behavioural products. In addition, the investigators of the study recommended the following tests on the basis of their reliabilities and factor saturation : Faces, with a loading of .40 and reliability of .37, and Expressions, with a loading of .36 and a reliability of .64, are CBU tests; Expression Grouping, with a loading of .59 and a reliability of .62, and Picture Exclusion, with a loading of .41 and a reliability of .34 are CBC tests; Social Relations, with a loading of .50 and a reliability of .29, and Silhouette Relations, with a loading of .40 and a reliability of .45, are CBR tests; Missing Pictures, with a loading of .58 and a reliability of .53, and Missing Cartoons, with a loading of .52 and a reliability of .77, are CBS tests; Picture Exchange, with a loading of .5I and a reliability of .43, and Social Translations with a loading of .5I and a reliability of .86, are CBT tests; Cartoon Predictions, with a loading of .55, and a reliability of .79 is a CBI test.

Tenopyr (I967) had subsequently used six of those tests in a California school which had records of students' scores on the School and College Ability Tests (SCAT) and the Sequential Tests of Educational Progress (STEP).

Guilford's work (I966) included revised forms of the following six tests: Cartoon Predictions, Expression Grouping, Missing Cartoons, Social Translations, Missing Pictures and Picture Exchange. Based on scores from those six tests, Guilford produced some C- scale norms.

CHAPTER IV

RESEARCH DESIGN AND METHODOLOGY

The major purpose of the present study is to provide further evidence for the validation of the construct of cognitive behavioural products, using a population of eighth graders. As was pointed out in the last chapter, O'Sullivan et al's experimental groups consisted of high school students of the eleventh grade. O'Sullivan had mentioned that further research needed to be done on a different kind of population or on populations of a different age group in order to confirm the hypothesis about cognitive behavioural abilities. For the purpose of this study, a younger population of eighth graders has been chosen. This chapter will detail the kind of cognitive behavioural tests used in the experiment, and outline the strategies adopted in selecting the reference tests.

Compared with other areas in the structure of intellect model, the characteristics of the behavioural content area are less well known particularly in relation to the factor of age, although Gates (1923) carried out a study somewhat in this direction. It is one of the aims of this study to look into the effect of age upon the various tests of cognitive behavioural products.

The present study was able to make use of the experimental tests of Guilford, O'Sullivan and de Mille, released specifically for research purpose. The characteristics of these experimental tests were; they were short tests, and they had low reliabilities. It will be recalled that Thurstone's (1938) method of test construction was first to find the general nature of the most important cognitive and conative primary traits by means of group procedures, and then to design more refined tests to feature the primary factors that have been found by the group methods.

For the purpose of this study, it will be necessary to carry out an item analysis of O'Sullivan et al's tests at grade eight level. Such analyses are usually carried out to find out the kind of items that can be used in longer, more reliable forms of the test. They are also carried out on a pool of items designed to measure individual differences on an intellectual factor known to exist. It will be seen that the inclusion of item analyses runs counter to both of the foregoing principles. In a preliminary investigation of this kind, however, item analysis becomes important both for improving the experimental version and in relation to establishing the existence of an intellectual factor of the kind hypothesized.

In summary, we are concerned with establishing a cognitive behavioural dimension at the eighth grade level. Suggestions relating the dimension to a theory of teaching, and for the conducting of preliminary work toward improved tests of the dimension (if its existence is demonstrated), will be indicated.

Hypotheses

The following hypotheses will be tested :

H_1 Mean scores on the cognitive behavioural product tests will increase with age.

H_2 The reliability of sub-tests will increase with age, but the reliability will generally be low.

H_3 Zero Order correlation will be obtained between cognitive behavioural tests and reference tests (for such other dimensions of the structure of intellect model as may be used).

Selection of experimental tests

As has already been noted, it is neither possible nor desirable to replicate fully the work of O'Sullivan et al with a younger population and to construct new cognitive behavioural tests for the purpose of this study. The writer, using volunteers as examinees, was able to make use of the experimental version of O'Sullivan et al, released specifically for research purpose. However, the present study was limited largely to an investigation of the four categories of CBC (cognitive behavioural classes), CBS (cognitive behavioural systems), CBT (cognitive behavioural transformations) and CBI (cognitive behavioural implications). The following tests were recommended on the basis of the size of factor loadings :

CBC	Expression Grouping
CBS	Missing Pictures
	Missing Cartoons
CBT	Picture Exchange
	Social Translations
CBI	Cartoon Predictions

The method used in demonstrating the existence of the cognitive behavioural products in the eighth graders was first to show that the mean cognitive behavioural scores of the eighth graders were higher than chance scores, higher mean scores being evidence that some kind of abilities existed. Then, to distinguish the hypothesized cognitive behavioural dimensions, it was necessary to use relevant reference tests as marker tests.

Selection of Reference Tests

Two general strategies were used in selecting the reference tests.

1. The first strategy was to choose tests which a number of researchers had hypothesized to measure abilities somewhat similar to that assessed by the experimental tests. For instance, Messick and Damarin (1963) had found that persons better at an embedded-figures task, similar to the task in Hidden Figures, an NFT (convergence of figural transformations) marker test, were superior at recall of social stimuli. It would seem useful to ascertain whether this superiority existed in the cognition area as well as in that of memory.

Since most of the behavioural tests used visual stimuli of one kind or another, it seemed desirable to ascertain whether any figural or spatial abilities were involved in taking them. Well known marker tests used to determine if this were the case were tests of speed of closure (CFU - cognition of figural units) and figural reasoning (CFR - cognition of figural relations).

2. The second strategy of deciding which reference factors to use was to separate the dimensions under investigation from all factors having two of the three structure of intellect parameters in common. The differentiation of cognitive behavioural factors from semantic cognition factors seemed most pertinent. On this basis, marker tests for the reference factors of CMU, verbal comprehension, CMC, verbal classification, CMR, verbal relations, and CMI, conceptual foresight or sensitivity to problems, were selected.

O'Sullivan et al used at least three tests in establishing a factor. However, since it was not the aim of this experimental design to name the factors, but to confirm the existence of the dimensions already demonstrated by O'Sullivan et al, it was not imperative to use three reference tests for each demonstration. In addition, severe limitation on testing time and the non-availability of established reference tests at the eighth grade level also played a part in reducing the number of reference tests selected.

The reference tests selected on the basis of the first strategy were as follows :

Concealed Words Test	(CFU)
Progressive Matrices	(CFR and CFT)
Squares Test	(CFT)
Hidden Figures	(NFT)
Alternate Uses	(DMI)

The reference tests selected on the basis of the second strategy were as follows :

The vocabulary test of the Henmon-Nelson Tests of Mental Ability (CMU).

Mill Hill Vocabulary Test, part A (CMU)

Mill Hill Vocabulary Test, part B (CMC)

Mathematics Test (CMS) - The well known reference tests for CMS are Mathematical Reasoning and Ship Destination. But Ship Destination is not suitable for grades below eleven. (The experiment was planned at a time when the school board proposed to use the DAT test, one sub-score of which is Mathematical Reasoning. Since the DAT has not yet been administered, it has become necessary to delete this reference test).

Apparatus Test (CMI)

Information about the majority of these tests is given in the Manual for Kit of Reference Tests for Cognitive Factors. (French, Ekstrom and Price, 1963). The Squares Test and Progressive Matrices Test are English tests whose factor compositions are given by Vernon (1950).

The sub-tests of the Progressive Matrices test were used as separate tests. The sub-tests were timed separately according to arbitrarily set time-limits; three minutes for Set B, four minutes for Set C, five minutes for Set D and six minutes for Set E. The following rationale would apply.

Accepting the practice adopted after 1940, many testers have administered the test within the given time-limit of twenty minutes, but without separate timing for each sub-test. Nevertheless, attempts at analysis by sub-test particularly B, C, D and E were made by Vernon (1950), Banks (1949) and Keir (1949). Their analyses showed that the sub-tests had different loadings. The time-limit imposed and the small number of items in Set E might well have caused Vernon to list Sets D and E together. Gabriel (1954), using Israeli army recruits and a different method of analysis, would have separated Sets D and E. Keir suggested a division of the sets into two main groups; Sets C and D which were of medium complexity could form one group, while B and E which were either exceptionally simple or exceptionally intricate could form another group. Keir also suggested a division of the sets on another basis; Sets C and E which were solved most readily by a "synthetic" or "intuitive" procedure, could be grouped together, whilst Set D which was solved most readily by an "analytical" and even a verbalized procedure could perhaps be grouped together with Set B. Following Meeker's (1965) procedure for examining items in terms of the structure of intellect model, it is hypothesized in the present study that Set B will be mainly a measure of CFR, Sets C and D will probably be a measure of CFT and NFR, and Set E will be a measure of EFT and NFT. The total score is most likely to be a measure of CFR and CFT.

In summary therefore, the four sub-tests were used as separate reference tests with separate time-limits. A total score was also arrived at on the argument that a total score obtained under these conditions was no less meaningful than the part scores obtained within an inclusive time-limit.

It is hypothesized in the present study that the two parts A and B of the Mill Hill Vocabulary test measure different factors. Part A, which is a vocabulary test, has been hypothesized to measure CMU, whilst Part B which is a synonyms test, has been hypothesized to measure CMC.

Test Administration

Arrangements were made to secure the co-operation of a school principal and teachers in order to enable the writer to administer the six experimental tests to 182 eighth graders. Since the school only allowed limited access to the students, not all the eighth graders who took the experimental tests were available during the second testing session when the reference tests were administered. Complete data was available on only 102 eighth graders.

Treatment of the data

1. Scoring - Item responses for all the cognitive behavioural

tests were key-punched and verified on IBM cards, whilst the subjects' responses to each reference test were scored by hand according to the rational key.

2. Statistical analysis :

a) The distribution of total scores of each of the six experimental variables was checked to ascertain whether it was normally distributed.

b) Reliability of sub-tests was calculated.

c) Means and Standard Deviations were computed for all part and for all total test scores.

d) Item versus sub-test total score correlations were obtained for all sub-tests.

e) Optimum test lengths were forecast for reliabilities of .90.

f) Pearson Product Moment Correlation Coefficients were obtained between sub-tests and reference tests for Grade 8, and were entered into a matrix for factor analysis.

g) Matrices of correlations were computer-analysed into a Principal component analysis. The factor loadings of the first five factors were scrutinized to see whether a factor interpretation based upon the signs of the factors was possible.

A Varimax rotation was then performed on the first four extracted factors.

h) An examination of the factor structure was also attempted by means of the "coefficient of belonging". (Holzinger and Harman, 1941).

(Statistical analysis procedures (a) - (d) were obtained through the CAGO program of the McGill computing centre. The factor analysis and rotation procedure were performed by standard computer programmes).

Finally, orthogonal rotations of axes, two at a time, were performed by hand, in an attempt to produce a structure in conformity with Guilford's hypothesis.

CHAPTER V

RESULTS

Table 1

Test constants for the six experimental tests

Sub-tests	Number of Items	Mean	Standard Deviation	Skewness	Ku
1. Cartoon Predictions	30	19.462	3.438	-0.999	2.
2. Social Translations	24	14.505	4.542	-0.930	-0.
3. Missing Cartoons	28	15.747	4.425	-0.254	-0.
4. Expression Grouping	30	15.593	3.626	0.064	0.
5. Picture Exchange	18	7.945	2.369	0.124	0.
6. Missing Pictures	20	10.165	2.786	-0.202	-0.
TOTAL	150	83.418	13.326	-0.266	-0.

n = 182

(K) = Kuder Richardson Formula 20.

IAPTER V

IESULTS

Table 1

For the six experimental tests

	Number of Items	Mean	Standard Deviation	Skewness	Kurtosis	Reliability (K)
lictions	30	19.462	3.438	-0.999	2.047	0.621
lations	24	14.505	4.542	-0.930	-0.232	0.809
oons	28	15.747	4.425	-0.254	-0.482	0.710
rouping	30	15.593	3.626	0.064	0.771	0.559
ange	18	7.945	2.369	0.124	0.045	0.294
ures	20	10.165	2.786	-0.202	-0.401	0.452
	150	83.418	13.326	-0.266	-0.766	0.836

lichardson Formula 20.

The total-score distributions of the six experimental variables are in general negatively skewed. Two of the distributions, 1 and 2 are markedly skewed. Distribution 1 shows a marked kurtosis.

The reliability of the six sub-tests is in general low. Tests 2 and 3 are the only tests which have a reliability that approaches the conventional standard. If the six sub-tests were to be presented as a single-test without separate time-limits, the reliability would be higher, and approach a conventionally acceptable value.

Each mean score is significantly different from zero. The t test reveals that each mean score is significantly different from the chance mean scores, these being 10 in test 1, 8 in test 2, 7.5 in test 3, 6 in test 5, and 6.7 in test 6. The higher mean scores would be evidence that each test measures some kind of ability or abilities. Hence, it is now appropriate to present this evidence in conjunction with the data obtained by other investigators.

Table 2

Mean scores for different grade levels

		n = 182	n = 266	n = 219	n = 17
		8th Grade		9th Grade[1]	
1.	Cartoon Predictions	19.46			
2.	Social Translations	14.51			
3.	Missing Cartoons	15.75	18.90	18.83	19.12
4.	Expression Grouping	15.59			
5.	Picture Exchange	7.95	9.56	9.53	9.52
6.	Missing Pictures	10.16			
	Picture Exclusion		12.68	12.72	12.58
	Reflections		9.78	9.69	9.98
	Silhouette Relations		14.14	14.09	14.14

1. Tenopyr, M.L. 1967.
2. Guilford J.P. 1966.
3. O'Sullivan et al.1965.

Table 2

scores for different grade levels

	n = 182	n = 266	n = 219	n = 173	n = 266	n = 240
	8th Grade		9th Grade[1]		10th Grade[2]	11th Grade[3]
ons	19.46				20.9	22.6
ons	14.51				14.8	17.5
	15.75	18.90	18.83	19.12	18.9	21.9
ing	15.59				19.1	20.2
	7.95	9.56	9.53	9.52	9.6	11.0
	10.16				13.2	14.6
n		12.68	12.72	12.58		13.3
		9.78	9.69	9.98		10.9
ions		14.14	14.09	14.14		14.1

57.

56.

1965.

The mean scores obtained for the tests listed increase with age. Therefore it can be concluded that probably these are tests of intelligence measuring some intellectual entities. It should be noted that there is some overlap between the three sets of data obtained by Tenopyr. The first set of means are obtained on the total sample of 266 subjects; the second set of means are obtained on subjects having taken the regular World History Course, and the third set of means are obtained on subjects having taken regular English Course, in a given California school.

It should be noted that the six tests used by Guilford on the tenth grade children are revised test forms. Following O'Sullivan's factor analysis, a number of minor changes have been made in the factored tests, based upon information she supplied. The changes include the reordering of items to achieve better graduated item difficulty within parts of each test, the exclusion of a few items from some tests, the addition of new items to one test, and the reduction of working-time limits in two tests.

Table 3

Item Analysis data for the six experimental tests

Point Biserial Correlation	1 Cartoon Predictions (Item no.)	2 Social Translations (Item no.)	3 Missing Cartoons (Item no.)	4 Expression Grouping (Item no.)
.00 - .09	15, 23,	12,	14,	
.10 - .19	11, 25, 29,	17, 23, 24,	8, 27,	3, 11, 24, 3
.20 - .29	1, 3, 4, 6, 8, 16, 18, 27, 28, 30,	11, 16, 22,	1, 13, 15, 25, 28,	1, 5, 8, 9, 13, 14, 15, 20, 21, 25, 27, 28,
.30 - .39	2, 5, 7, 13, 14, 19, 21, 24, 26,	4, 7, 8, 20,	2, 4, 5, 7, 11, 19, 20, 21, 24, 26,	2, 4, 6, 7, 16, 17, 19, 29,
.40 - .49	9, 10, 12, 17, 20, 22,	10,	3, 6, 10, 12, 16, 17, 18, 22, 23,	23,
.50 - .59		5, 6, 9, 13, 18, 19,	9,	
.60 - .69		1, 2, 3, 14, 15, 21,		

le 3

a for the six experimental tests

1 Cartoon Predictions (Item no.)	2 Social Translations (Item no.)	3 Missing Cartoons (Item no.)	4 Expression Grouping (Item no.)	5 Pictu Excha (Item
15, 23,	12,	14,		
11, 25, 29,	17, 23, 24,	8, 27,	3, 11, 24, 30,	8,
., 3, 4, 6, ;, 16, 18, 27, 28, 30,	11, 16, 22,	1, 13, 15, 25, 28,	1, 5, 8, 9, 12, 13, 14, 15, 18, 20, 21, 25, 26, 27, 28,	1, 2, 10, 1 13, 1 18,
?, 5, 7, 13, .4, 19, 21, 24, 26,	4, 7, 8, 20,	2, 4, 5, 7, 11, 19, 20, 21, 24, 26,	2, 4, 6, 7, 10, 16, 17, 19, 22, 29,	3, 6, 16,
), 10, 12, 17, 20, 22,	10,	3, 6, 10, 12, 16, 17, 18, 22, 23,	23,	7,
	5, 6, 9, 13, 18, 19,	9,		
	1, 2, 3, 14, 15, 21,			

six experimental tests

ns (.)	2 Social Translations (Item no.)	3 Missing Cartoons (Item no.)	4 Expression Grouping (Item no.)	5 Picture Exchange (Item no.)
	12,	14,		
9,	17, 23, 24,	8, 27,	3, 11, 24, 30,	8,
6, , 27,	11, 16, 22,	1, 13, 15, 25, 28,	1, 5, 8, 9, 12, 13, 14, 15, 18, 20, 21, 25, 26, 27, 28,	1, 2, 4, 5, 10, 11, 12, 13, 15, 17, 18,
13, 1, 24,	4, 7, 8, 20,	2, 4, 5, 7, 11, 19, 20, 21, 24, 26,	2, 4, 6, 7, 10, 16, 17, 19, 22, 29,	3, 6, 9, 14, 16,
, 17,	10,	3, 6, 10, 12, 16, 17, 18, 22, 23,	23,	7,
	5, 6, 9, 13, 18, 19,	9,		
	1, 2, 3, 14, 15, 21,			

ests

	3 Missing Cartoons (Item no.)	4 Expression Grouping (Item no.)	5 Picture Exchange (Item no.)	6 Missing Pictures (Item no.)
	14,			8, 10, 20,
4,	8, 27,	3, 11, 24, 30,	8,	3, 4, 5, 9, 11, 13, 14, 15, 19,
2,	1, 13, 15, 25, 28,	1, 5, 8, 9, 12, 13, 14, 15, 18, 20, 21, 25, 26, 27, 28,	1, 2, 4, 5, 10, 11, 12, 13, 15, 17, 18,	6, 16, 17, 18,
20,	2, 4, 5, 7, 11, 19, 20, 21, 24, 26,	2, 4, 6, 7, 10, 16, 17, 19, 22, 29,	3, 6, 9, 14, 16,	1, 2, 7, 12,
	3, 6, 10, 12, 16, 17, 18, 22, 23,	23,	7,	
13,	9,			
14,				

It is recognised that the point biserial correlations are lower than the corresponding biserial correlations, and a point biserial correlation of .30 is generally aimed at. Based on this kind of criterion, therefore, it would be necessary to improve the following items in the various tests in order that they be made more suitable for eighth grade children.

Test 1. items 1, 3, 4, 6, 8, 11, 15, 16, 18, 23, 25, 27, 28, 29, 30.

Test 2. items 11, 12, 16, 17, 22, 23, 24.

Test 3. items 1, 8, 13, 14, 15, 25, 27, 28.

Test 4. items 1, 3, 5, 8, 9, 11, 12, 13, 14, 15, 18, 20, 21, 24, 25, 26, 27, 28, 30.

Test 5. items 1, 2, 4, 5, 8, 10, 11, 12, 13, 15, 17, 18.

Test 6. items 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, 19, 20.

The low reliability of the six tests has been noted earlier. In order that the reliability should be as high as .90, the tests must be lengthened as follows :-

Table 4

Test lengths for criterion reliability of .90

	Sub-tests	Test Length Forecast
1.	Cartoon Predictions	5.5
2.	Social Translations	2.1
3.	Missing Cartoons	3.7
4.	Expression Grouping	7.1
5.	Picture Exchange	22.0
6.	Missing Pictures	11.0

The test length forecast was obtained by using the Spearman-Brown formula:

$$n = \frac{r_{nn}(1-r_{11})}{r_{11}(1-r_{nn})}$$

The test most susceptible to improvement through lengthening would be test 2, while the test least susceptible to improvement through lengthening would be test 5.

The six experimental tests in their present form are far from being suitable to eighth grade children. If the tests were to be of any practical value at the eighth grade level, in terms of reliability and validity, a good deal of work would have to be done on them. On the basis of the findings so far obtained, Social Translations seems to be a test most suitable for improvement.

Reference tests were included in the battery of tests. The correlation matrix obtained is given in Table 5.

For an n of 102, all correlation coefficients of less than .195 are non-significant at the .05 level. (Lacey 1953, table 6 p. 245). There are 337 non-significant correlation coefficients in the matrix given in Table 5, constituting 52 per cent of the total. Guilford (1941) had indicated that any genuine zero correlation between pairs of intellectual tests would be sufficient to disprove the existence of g. The large number of non-significant correlation coefficients and zeros in the matrix would therefore, be evidence of the non-existence of g as an explanatory concept for this matrix.

Table 5

Correlation Matrix (22 variables)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Cartoon Predictions		34	42	12	34	21	24	00	-05	07	-07	11	18	16
2. Social Translations			37	23	38	21	14	12	07	03	05	20	27	21
3. Missing Cartoons				19	41	39	30	08	18	-10	-03	11	17	09
4, Expression Grouping					19	08	10	11	14	-09	-15	27	33	11
5. Picture Exchange						27	13	15	17	05	01	15	13	01
6. Missing Pictures							23	03	-08	-06	03	16	03	25
7. Squares Test								10	19	-09	-00	18	18	27
8. Hidden Figures A									46	-03	00	02	15	-04
9. Hidden Figures B										-08	06	05	14	-04
10. Concealed Words A											23	-03	05	00
11. Concealed Words B												01	-07	-02
12. Vocabulary A													48	23
13. Vicabulary B														13
14. Alternate Uses														
15. Apparatus Test														
16. Henmon Nelson														
17. I. Q.														
18. Progressive Matrices Total														
19. Matrix B														
20. Matrix C														
21. Matrix D														
22. Matrix E														

(Note - Decimal points omitted)

Table 5

Correlation Matrix (22 variables)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
ions		34	42	12	34	21	24	00	-05	07	-07	11	18	16	21	28	
ions			37	23	38	21	14	12	07	03	05	20	27	21	13	38	
s				19	41	39	30	08	18	-10	-03	11	17	09	03	30	
ping					19	08	10	11	14	-09	-15	27	33	11	11	28	
e						27	13	15	17	05	01	15	13	01	14	20	
s							23	03	-08	-06	03	16	03	25	05	31	
								10	19	-09	-00	18	18	27	14	32	
A									46	-03	00	02	15	-04	-14	19	
B										-08	06	05	14	-04	-05	20	
A											23	-03	05	00	05	-01	-
B												01	-07	-02	-15	-10	-
													48	23	14	55	
														13	12	52	
															42	31	
																20	

rices Total

te - Decimal points omitted)

Table 5

Correlation Matrix (22 variables)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ons		34	42	12	34	21	24	00	-05	07	-07	11	18	16	21	28	25	17
ons			37	23	38	21	14	12	07	03	05	20	27	21	13	38	35	23
				19	41	39	30	08	18	-10	-03	11	17	09	03	30	26	39
ing					19	08	10	11	13	-09	-15	27	33	11	11	28	27	20
						27	13	15	17	05	01	15	13	01	14	20	21	20
							23	03	-08	-06	03	16	03	25	05	31	25	28
								10	19	-09	-00	18	18	27	14	32	33	43
									46	-03	00	02	15	-04	-14	19	24	18
										-08	06	05	14	-04	-05	20	26	35
A											23	-03	05	00	05	-01	-04	14
B												01	-07	-02	-15	-10	-09	03
													48	23	14	55	52	14
														13	12	52	58	17
															42	31	30	20
																20	25	21
																	93	37
																		37
ices Total																		

te - Decimal points omitted)

Table 5

n Matrix (22 variables)

3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
2	12	34	21	24	00	-05	07	-07	11	18	16	21	28	25	17	04	-02	18	19
7	23	38	21	14	12	07	03	05	20	27	21	13	38	35	23	11	08	07	26
	19	41	39	30	08	18	-10	-03	11	17	09	03	30	26	39	12	16	24	40
		19	08	10	11	13	-09	-15	27	33	11	11	28	27	20	02	09	22	18
			27	13	15	17	05	01	15	13	01	14	20	21	20	01	07	21	21
				23	03	-08	-06	03	16	03	25	05	31	25	28	16	12	32	15
					10	19	-09	-00	18	18	27	14	32	33	43	27	16	28	37
						46	-03	00	02	15	-04	-14	19	24	18	01	11	-02	28
							-08	06	05	14	-04	-05	20	26	35	08	34	00	41
								23	-03	05	00	05	-01	-04	14	02	10	13	12
									01	-07	-02	-15	-10	-09	03	-01	08	-23	16
										48	23	14	55	52	14	07	-01	22	10
											13	12	52	58	17	11	06	17	12
												42	31	30	20	11	05	25	12
													20	25	21	15	02	18	18
														93	37	27	10	31	28
															37	25	11	28	31
																49	71	62	74
																	19	24	06
																		30	39
																			18

ints omitted)

Unities were first entered in the diagonal, which allows the emergence of as many factors as there are test variables. By an iterative process, using the new communalities in the diagonals, the following final diagonal entries were selected for an analysis into fewer than n factors:

0.371, 0.332, 0.563, 0.151, 0.352, 0.259, 0.248, 0.315, 0.559, 0.026, 0.043, 0.386, 0.412, 0.241, 0.182, 0.837, 0.883, 1.232, 0.198, 0.441, 0.420, 0.538,

A principal component analysis yielded four significant factors. However, for purposes of interpretation the fifth factor has been included in Table 6.

Table 6

Principal Component Analysis (5 factors)

Tests		I	II	III	IV	V
1. Cartoon Predictions	(CBI)	388	-158	267	-354	086
2. Social Translations	(CBT)	460	-152	037	-308	174
3. Missing Cartoons	(CBS, CBU, CBI)	538	078	155	-493	-164
4. Expression Grouping	(CBC)	357	-133	-071	-038	-120
5. Picture Exchange	(CBT)	391	-029	078	-438	-008
6. Missing Pictures	(CBS)	392	-038	286	-151	-127
7. Squares Test	(CFT)	486	074	078	013	-047
8. Hidden Figures A	(NFT)	245	125	-466	-150	-076
9. Hidden Figures B	(NFT)	345	314	-578	-094	-078
10. Concealed Words A	(CFU)	031	117	083	064	307
11. Concealed Words B	(CFU)	048	162	-092	-079	331
12. Vocabulary A	(CMU)	447	-393	-087	154	046
13. Vocabulary B	(CMC)	479	-353	-217	100	039
14. Alternate Uses	(DMI)	353	-167	252	158	145
15. Apparatus Test	(CMI)	283	-128	259	137	181
16. Henmon Nelson	(CMU)	781	-426	-151	155	-008
17. I. Q.	(CMU)	785	-416	-248	181	018
18. Progressive Matrices	Total	830	685	152	260	003
19. Matrix B	(CFU, CFR)	336	115	125	240	-077
20. Matrix C	(CFT, NFR)	378	519	-050	149	-003
21. Matrix D	(CFT, NFR)	504	106	334	201	-227
22. Matrix E	(NFT, NFT)	580	404	-132	-142	235

(Note - Decimal Points omitted)

By including the fifth factor, over-factorization would result. Table 7 lists the communalities of the first four factors and the corresponding diagonal entries.

Table 7

Communalities of first four factors

Tests	Communalities I	II	III	IV	Total	Diagonal Entries
1. Cartoon Predictions	150	025	071	125	371	371
2. Social Translations	212	023	001	095	331	331
3. Missing Cartoons	289	006	024	243	562	563
4. Expression Grouping	127	018	005	000	150	151
5. Picture Exchange	153	001	006	192	352	352
6. Missing Pictures	154	001	082	023	260	259
7. Squares Test	236	005	006	000	247	248
8. Hidden Figures A	060	016	217	023	316	315
9. Hidden Figures B	119	099	334	009	561	560
10. Concealed Words A	001	014	007	004	026	026
11. Concealed Words B	002	026	008	006	042	043
12. Vocabulary A	200	154	008	024	386	386
13. Vocabulary B	229	125	047	010	411	411
14. Alternate Uses	125	028	064	025	242	241
15. Apparatus Test	080	016	067	019	182	182
16. Hemmon Nelson	610	181	023	024	838	838
17. I. Q.	616	174	062	033	885	884
18. Progressive Matrices Total	689	469	023	068	1.249	1.249
19. Matrix B	113	013	016	058	200	198
20. Matrix C	143	269	003	022	437	437
21. Matrix D	254	011	112	040	417	417
22. Matrix E	336	163	017	020	536	537
Total	4.898	1.837	1.203	1.063	9.001	
	54.4%	20.4%	13.4%	11.8%	100.00%	

As can be expected, factor 1 explains the largest amount of variance. In percentage terms, factor 1 explains 54.4 per cent of the variance, factor II 20.4 per cent, factor III 13.4 per cent, and factor IV 11.8 per cent.

As is also expected, all the tests have positive loadings on factor I except test 11 which is Concealed Words B. Tests 18 (Progressive Matrices Total), 17 (I.Q.) and 16 (Henmon Nelson) have the largest loadings on factor I. The large loading that test 18 has (.83) no doubt arises from the way the score is derived. English factorists looking at this pattern would conclude that this is a measure of g. But Guilford would deny the existence of g on the ground that there are too many zeros in the correlation matrix.

Factors II, III, IV, and V are bi-polars. Tests 18 (Progressive Matrices Total), 20 (Matrix C), 22 (Matrix E), and 9 (Hidden Figures B) have large loadings on factor II, and these are contrasted with tests 16 (Henmon Nelson) 17 (I.Q.), 12 (Mill Hill Vocabulary A) and 13 (Mill Hill Vocabulary B). It can be concluded that tests with highly verbal content are contrasted with tests of figural content. One would expect, therefore, that tests 19 (Matrix B), 21 (Matrix D) and 8 (Hidden Figures A) would also have high loadings along with tests 18, 20, 22 and 9, but they were shown to have no significant loadings.

Accepting the conventional practice of taking into consideration only factor loadings that exceed .30, tests 6 (Missing Pictures), 1 (Cartoon Predictions), 15 (Apparatus Test) and 14 (Alternate Uses) do not have sufficiently large loadings on factor III. However these tests and test 21 (Matrix D) may be contrasted with tests 8 (Hidden Figures A) and 9 (Hidden Figures B).

Tests 1 (Cartoon Predictions), 2 (Social Translations), 3 (Missing Cartoons) and 5 (Picture Exchange) which have significant loadings on factor IV, may be contrasted with possibly tests 18 (Progressive Matrices Total) and 19 (Matrix B).

If factor V had any significanse at all, tests 10 (Concealed Words A) and 11 (Concealed Words B) would seem to be its marker tests.

The factor pattern shows indications of what the six experimental tests do not measure. The six tests have loadings on unrotated factor I. They are not involved in the two contrasting groups of factor loadings on factor II, the highly verbal loadings and the highly figural loadings. Tests 8 (Hidden Figures A) and 9 (Hidden Figures B) seem to be the marker tests for factor III, and these are reference tests for NFT. Hence the six experimental tests do not measure NFT. The factor loadings on factor IV yield further evidence supportive of the interpretation of factor II. Tests 1, 2, 3 and 5 do not measure abilities dealing with figural content. If factor V is interpretable, it is a factor measured by marker tests 10 and 11. These two tests are reference tests for CFU. This is again evidence supportive of the interpretation of factors II and IV. Therefore an inference can be made that substantial proportions of the variance of the six experimental tests may be attributed to abilities other than those typically associated with intellectual achievement. The abilities measured by the six experimental tests are, probably, in terms of Guilford's model, distinct factors. On the basis of the above factor interpretation, these factors may then be behavioural abilities.

The non-significance of the rest of the factor loadings in the matrix makes further analysis impossible. O'Sullivan, using 52 tests, obtained 19 unrotated factors, 18 of which were rotated in line with her hypothesized factor structure. Due to the greater number of tests used and a larger and older population experimented on, she was able to extend her analysis over more factors, though 18 factors from 52 tests is somewhat above expectation. She extracted higher communalities for the six experimental tests although the test reliabilities were low : (A communality value of .52 was obtained for test 1, .64 for test 2, .82 for test 3, .77 for test 4, .58 for test 5, and .56 for test 6). O'Sullivan obtained all the 19 factors that she hypothesized in her study.

The present study aims at demonstrating the existence of four cognitive behavioural factors (CBC, CBS, CBI and CBT) using a limited number of experimental tests and reference tests. Given the small number of subjects, and the fact that the tests have low reliabilities at the eighth grade level, it would be impossible to get a clear, confirmation of Guilford's hypothesis. However, there are indications that the six experimental tests may be measures of a specific dimension dealing with behavioural content.

For further evidence, other methods must be resorted to. Burt recommended the method of scanning the sign patterns of tests in order to know which tests could be classified together.

Table 8

Factor Matrix (Sign pattern)

Hypothesized Factors		Tests	Signs I	II	III	IV
1.	CBI	Cartoon Predictions	+	-	+	-
2.	CBT	Social Translations	+	-	+	-
3.	CBS, CBI, CBU,	Missing Cartoons	+	+	+	-
4.	CBC	Expression Grouping	+	-	-	-
5.	CBT	Picture Exchange	+	-	+	-
6.	CBS	Missing Pictures	+	-	+	+
7.	CFT	Squares Test	+	+	+	+
8.	NFT	Hidden Figures A	+	+	-	-
9.	NFT	Hidden Figures B	+	+	-	-
10.	CFU	Concealed Words A	+	+	+	+
11.	CFU	Concealed Words B	-	+	-	-
12.	CMU	Vocabulary A	+	-	-	+
13.	CMC	Vocabulary B	+	-	-	+
14.	DMI	Alternate Uses	+	-	+	+
15.	CMI	Apparatus Test	+	-	+	+
16.	CMU	Henmon Nelson	+	-	-	+
17.	CMU	I. Q.	+	-	-	+
18.	CFR, CFT	Progressive Matrices Total	+	+	+	+
19.	CFU, CFR	Matrix B	+	+	+	+
20.	CFT, NFR	Matrix C	+	+	-	+
21.	CFT, NFR	Matrix D	+	+	+	+
22.	EFT, NFT	Matrix E	+	+	-	-

Table 9

Distribution of tests by Sign Pattern

Sign Pattern	Tests
1. + + + +	7, 10, 18, 19, 21,
2. + + + −	3,
3. + + − +	20,
4. + − + +	14, 15,
5. + − − +	12, 13, 16, 17,
6. + − − −	4,
7. + − + −	1, 2, 5, 6,
8. − + − −	11,
9. + + − −	8, 9, 22,

The first group consists of tests with figural content: Tests 7 (Squares Test, CFT), 10 (Concealed Words A, CFU), 18 (Progressive Matrices Total), 19 (Matrix B, CFU,CFR) and 21 (Matrix D, CFT,NFR,). Test 3 (Missing Cartoons) forms a group by itself. O'Sullivan has indicated that while it is a measure of CBS, it has loadings also on CBU and CBI. It is surprising that Test 20, (Matrix C) which is hypothesized as a measure of CFT and NFR, does not belong to the first group but forms a separate group by itself. The fourth group consists of tests measuring semantic implication abilities: Test 14

(Alternate Uses) is a measure of DMI and Test 15 (Apparatus Test) is a measure of CMI. The fifth group consists of tests 12 (MillHill Vocabulary A, CMU), 13 (Mill Hill Vocabulary B, possibly CMU or CMC). 16 (Henmon Nelson, CMU) and 17 (I.Q., CMU). This group, therefore, is essentially a verbal group. Test 4 (Expression Grouping, CBC) is independent of all other tests. The seventh group is made up of four of the six experimental tests; tests 1 (Cartoon Predictions, CBI), 2 (Social Translations, CBT), 5 (Picture Exchange CBT) and 6 (Missing Pictures CBS). The fact that test 11 (Concealed Words B, CFU) forms one independent group is least expected. The ninth group consists of tests which are measures of figural transformations; both tests 8 (Hidden Figures A) and 9 (Hidden Figures B) are measures of NFT, while test 22 (Matrix E) is hypothesized to measure EFT and NFT.

With the method of sign pattern, there is evidence that tests 1, 2, 5 and 6 are independent of the others; test 3 forms a separate group and test 4 forms another separate group. The indication that the six experimental tests do not involve the abilities measured by verbal tests, tests with figural content and other reference tests, is evidence supportive of Guilford's hypothesis about the existence of a distinct behavioural dimension.

However, the evidence is far from being conclusive, and an attempt must be made to establish further evidence by using an external objective method which utilizes size of loadings more than signs. Such a method, although no longer in general use, was given originally by Holzinger and Harman (1941). It involves the computation of "Coefficients of belonging". It is an objective method in that one starts with the highest correlation coefficient and then the correlation that is next in size is added. This method has a draw-back, as Holzinger and Harman have noted; it can be used to confirm a preconceived idea. However, this method was employed objectively in this study.

Table 10 gives the B coefficients obtained.

Table 10

Coefficients of Belonging (Holzinger)

	P	L	S	200(n-p)	T	(P-1
(12,16)	2	.555	.555	3600	6.812	6.8
(12,16,13)	3	1.004	1.559	3400	8.060	16.1
(12,16,13,2)	4	.848	2.407	3200	9.992	29.9
(12,16,13,4)	4	.879	2.438	3200	8.832	26.4
(12,16,13,1)	4	.563	2.122	3200	9.887	29.6
(12,16,13,3)	4	.572	2.131	3200	10.753	32.2
(12,16,13,5)	4	.486	2.045	3200	10.305	30.9
(12,16,13,6)	4	.507	2.066	3200	9.918	29.7
(8,9,)	2	.457	.457	3600	2.856	2.8
(8,9,22)	3	.685	1.142	3400	5.634	11.2
(8,9,22,3)	4	.669	1.811	3200	8.133	24.3
(8,9,22,20)	4	.844	1.986	3200	6.328	18.9
(8,9,22,7)	4	.663	1.805	3200	7.826	23.4
(8,9,22,1)	4	.238	1.380	3200	8.011	24.0
(8,9,22,2)	4	.446	1.588	3200	8.370	25.1
(8,9,22,6)	4	.264	1.406	3200	7.978	23.9
(8,9,22,5)	4	.527	1.669	3200	7.797	23.3
(14,15)	2	.417	.417	3600	4.574	4.5
(14,15,7)	3	.411	.828	3400	7.270	21.8
(14,15,21)	3	.432	.849	3400	6.967	13.8
(14,15,1)	3	.369	.786	3400	6.799	13.5
(14,15,2)	3	.337	.754	3400	7.191	14.3
(14,15,3)	3	.116	.533	3400	8.175	16.3
(14,15,5)	3	.157	.574	3400	7.477	14.9
(14,15,6)	3	.297	.714	3400	6.852	13.7
(1,3)	2	.423	.423	3600	5.944	5.9
(1,3,5)	3	.741	1.164	3400	7.679	15.2
(1,3,5,2)	4	1.081	2.245	3200	9.145	27.4
(1,3,5,6)	4	.878	2.042	3200	8.795	26.3
(21,6)	2	.316	.316	3600	5.497	5.4
(21,6,7)	3	.506	.822	3400	8.003	16.0
(21,6,20)	3	.419	.735	3400	7.041	14.0
(19,7)	2	.274	.274	3600	5.005	5.0
(19,7,20)	3	.355	629	3400	6.677	13.2
(11,10)	2	.235	.235	3600	.629	.6
(11,10,4)	3	- 240	- 005	3400	-	-

Table 10

Coefficients of Belonging (Holzinger)

P	L	S	200(n-p)	T	(P-1)T	$B = \frac{200(n-p)S}{(p-1)T}$
2	.555	.555	3600	6.812	6.812	293
3	1.004	1.559	3400	8.060	16.120	329
4	.848	2.407	3200	9.992	29.976	257
4	.879	2.438	3200	8.832	26.496	294
4	.563	2.122	3200	9.887	29.661	230
4	.572	2.131	3200	10.753	32.259	211
4	.486	2.045	3200	10.305	30.915	212
4	.507	2.066	3200	9.918	29.754	222
2	.457	.457	3600	2.856	2.856	576
3	.685	1.142	3400	5.634	11.268	591
4	.669	1.811	3200	8.133	24.399	238
4	.844	1.986	3200	6.328	18.984	335
4	.663	1.805	3200	7.826	23.478	246
4	.238	1.380	3200	8.011	24.033	184
4	.446	1.588	3200	8.370	25.110	202
4	.264	1.406	3200	7.978	23.934	187
4	.527	1.669	3200	7.797	23.391	229
2	.417	.417	3600	4.574	4.574	328
3	.411	.828	3400	7.270	21.810	129
3	.432	.849	3400	6.967	13.834	209
3	.369	.786	3400	6.799	13.598	196
3	.337	.754	3400	7.191	14.382	178
3	.116	.533	3400	8.175	16.350	110
3	.157	.574	3400	7.477	14.954	135
3	.297	.714	3400	6.852	13.704	177
2	.423	.423	3600	5.944	5.944	256
3	.741	1.164	3400	7.679	15.258	515
4	1.081	2.245	3200	9.145	27.435	262
4	.878	2.042	3200	8.795	26.385	248
2	.316	.316	3600	5.497	5.497	207.
3	.506	.822	3400	8.003	16.006	174
3	.419	.735	3400	7.041	14.082	177
2	.274	.274	3600	5.005	5.005	197
3	.355	629	3400	6.677	13.254	161
2	.235	.235	3600	.629	.629	1345
3	- 240	- 005	3400	-	-	-

The method of computation of "Coefficients of belonging" is possible only when there are separate tests and not parallel versions. Hence, tests 18 (Progressive Matrices Total) and 17 (I.Q.) were excluded during the calculation process. On the basis of the argument that there are no four separate factors in the Progressive Matrices Test, but only one total score, Table 11 is presented, thus removing variables 17, 19, 20, 21 and 22.

Table 11

Coefficients of Belonging (reduced number of variables)

	P	L	S	200(n-1)p	T	(p-1)T
(12,16)	2	.555	.555	3000	5.984	5.984
(12,16,13)	3	1.004	1.559	2800	6.950	13.900
(12,16,13,4)	4	.879	2.438	2600	7.418	22.254
(12,16,13,2)	4	.848	2.407	2600	8.857	25.571
(8,9)	2	.457	.457	3000	2.176	2.176
(8,9,18)	3	.526	.983	2800	4.748	9.496
(7,18)	2	.430	.430	3000	5.631	5.631
(7,18,3)	3	.696	1.126	2800	7.544	15.088
(7,18,6)	3	.506	.936	2800	7.029	14.058
(7,18,6,3)	4	1.088	2.124	2600	8.158	24.474
(7,18,6,3,1)	5	1.045	3.169	2400	8.801	35.204
(7,18,6,3,2)	5	.946	3.070	2400	9.599	39.396
(7,18,6,3,1,2)	6	1.284	4.453	2200	9.566	47.830
(14,15)	2	.417	.417	3000	3.088	3.088
(1,3)	2	.423	.423	3000	5.192	5.192
(1,3,5)	3	.741	1.164	2800	6.631	13.262
(1,3,5,2)	4	1.081	2.245	2600	7.802	23.406
(1,3,5,2,6)	5	1.295	3.540	2400	8.545	34.280
(1,3,5,2,6,4)	6	.811	4.351	2200	9.149	47.745

Table 11

onging (reduced number of variables)

L	S	200(n-1)p	T	(p-1)T	200(n-1)pS	200(n-1)pS / (p-1)T
.555	.555	3000	5.984	5.984	1665	278
1.004	1.559	2800	6.950	13.900	4365.2	314
.879	2.438	2600	7.418	22.254	6338.8	284
.848	2.407	2600	8.857	25.571	6258.2	245
.457	.457	3000	2.176	2.176	1371	630
.526	.983	2800	4.748	9.496	2754.4	290
.430	.430	3000	5.631	5.631	1290	229
.696	1.126	2800	7.544	15.088	3152.8	209
.506	.936	2800	7.029	14.058	2620.8	186
1.088	2.124	2600	8.158	24.474	5522.4	222
1.045	3.169	2400	8.801	35.204	7605.6	216
.946	3.070	2400	9.599	39.396	7368.0	187
1.284	4.453	2200	9.566	47.830	9796.6	205
.417	.417	3000	3.088	3.088	1251	405
.423	.423	3000	5.192	5.192	1269	244
.741	1.164	2800	6.631	13.262	3259.2	244
1.081	2.245	2600	7.802	23.406	5837	249
1.295	3.540	2400	8.545	34.280	8496	248
.811	4.351	2200	9.149	47.745	9572.2	201

The tests are classified into five groups. The first group consists of tests 12, 16 and 13; the second group consists of tests 8, 9 and 18; the third group consists of tests 7 and 18; the fourth group consists of tests 14 and 15; and the fifth group consists of tests 1, 2, 3, 5 and 6. Here again there is evidence that the experimental tests 1, 2, 3, 5 and 6, as a group, are distinct from the other tests, and test 4 is independent of the others.

There remains now only the procedure of factor rotations. It is highly inappropriate to use oblique rotations to confirm a solution derived from orthogonal rotations. Therefore two other solutions have been proposed; the Varimax rotations which follows an objective method (Kaiser 1956) and the orthogonal rotations by hand, two at a time, which is a more subjective method.

Orthogonal rotations of factors really increase the communality of later factors at the expense of the first unrotated factor. A relatively simple approach, therefore, is to plot each factor in turn against the first factor and so successively diminishing the variance which the first factor contains. Two sub-methods are then possible. In the first method, one maximizes what is believed to be the major reference (or experimental) factor, and to do this successively for each factor. One must then examine what is left of the first factor to see if any meaning is possible. Another method is to take each factor in turn with the first unrotated factor, and each rotation is to be made meaningful. The last rotation involves the remaining variance of the first factor and that factor with the highest loadings on the experimental tests. Thus each rotation is first made meaningful and then an attempt is made to see what solution this leaves for the experimental tests.

Acting on the assumption that Factor V is significant, Factor I was rotated with Factor V so as to result in high loadings on tests 10 and 11 (CFU), Factor I was then rotated against Factor III in such a way as to maximize loadings on Tests 8 and 9 (NFT), Factor I was again rotated, this time against Factor II to maximize verbal loadings on Tests 12, 13, 16 and 17, and finally Factor I was rotated against Factor IV to maximize loadings on Tests 2 and 5 (CBT). As can be seen in Table 12, the above rotations left a set of loadings on the first factor (the sign of which is negative) with most variance on Tests 18 and 22 (Progressive Matrices Total, CFR and CFT, and Matrix E, NFT and EFT,).

In terms of this solution, cognitive behavioural loadings appear on five tests; tests 2, 3, 5, 6 and 22. One would then have to interpret the high loadings on test 22

(Matrix E), which is the most difficult of the four Matrix sub-tests. The high loadings may be due to the complexity involved, or it may be possible that cognitive behavioural ability is involved in solving Matrix E.

By the alternative method, and assuming only four significant factors, Factor III was rotated against Factor I to maximize the NFT loadings on tests 8 and 9, followed by the rotation of Factor II against Factor I to maximize the cognitive figural loadings on tests 18, 20, 21 and 22. As expected, test 18 which is a composite of various cognitive figural factors, has the highest maximized loadings. Finally Factor I was rotated against Factor IV to maximize the cognitive semantic factor loadings, particularly the CMU loadings on tests 16 and 17 (Henmon Nelson and I.Q.). As seen in Table 13, the above rotations left a solution on Factor IV where the significant loadings were on cognitive behavioural tests 1, 2, 3 and 5. In line with the major hypothesis of the present study, this would be supportive evidence for the existence of a cognitive behavioural dimension. However, one would have to explain the significant loadings tests 1 and 2 have on Factor I, and test 3 on Factor II. Possibly tests 1 (Cartoon Predictions, CBI) and 2 (Social Translations, CBT) involve some semantic ability. Test 3 (Missing Cartoons) is not a univocal measure of CBS.

As O'Sullivan has noted, Missing Cartoons has mixed loadings on CBS, CBU and CBI. The possibility that it may also involve cognitive figural ability would explain its significant loadings on Factor II.

Both methods of orthogonal rotations provide some evidence for the existence of the cognitive behavioural dimension, the better solution being provided by the second method.

The varimax rotation method yields an uninterpretable factor pattern. Table 14 shows the results of the varimax rotation. According to this method, tests 1, 5, 17 and 21 (Cartoon Predictions CBI, Picture Exchange CBT, I.Q CMU and Matrix D CFT,NFR,) have significant loadings on Factor I; tests 4, 6, 7, 12, 14 and 20 (Expression Grouping CBC, Missing Pictures CBS, Squares Test CFT, Vocabulary A CMU, Alternate Uses DMI, and Matrix C CFT,NFR,) have significant loadings on Factor II; tests 2, 3, 16 and 20 (Social Translations CBT, Missing Cartoons CBS, CBU, CBI, Henmon Nelson CMU and Matrix C CFT,NFR,) have significant loadings on Factor III; tests 4, 9, 13 and 17 (Expression Grouping CBC, Hidden Figures B NFT, Vocabulary B CMC, and I.Q. CMU) have significant loadings on Factor IV.

The varimax rotation method does not seem to yield any confirmatory evidence for the major hypothesis in the present study. If the cognitive behavioural dimension does exist, the varimax rotation divides it among Factors I, II, III and IV.

Table 12

Orthogonal Rotation (1)

Tests	Rotated Factors				
	I'''	II'	III'	IV'	V'
1	-193	222	-063	283	214
2	-077	363	021	321	320
3	096	391	169	670	030
4	-056	304	249	085	009
5	-072	286	117	484	127
6	-164	396	-022	299	015
7	-298	284	169	193	122
8	016	-092	532	172	007
9	-145	-189	677	216	045
10	-111	042	-034	039	298
11	-103	-040	001	169	295
12	-017	490	277	-175	196
13	010	436	407	-129	200
14	-193	387	023	-058	257
15	-169	314	-122	-049	267
16	-137	703	500	-094	260
17	-130	657	581	-130	285
18	-815	100	258	252	287
19	-404	190	063	-011	043
20	-556	-137	221	208	132
21	-533	408	-013	128	-041
22	-349	-020	176	417	419

(Note - Decimal points are omitted)

Factors I and V are rotated through 70°

Factors I' and III are rotated through 150°

Factors I'' and II are rotated through 312°

Factors I''' and IV are rotated through 155°

Table 13

Orthogonal Rotation (2)

Tests	Rotated Factors			
	I'''	II'	III'	IV'
1	351	141	-032	477
2	320	115	065	421
3	239	376	135	588
4	276	-048	240	123
5	124	148	128	496
6	131	081	-052	198
7	263	280	311	067
8	-095	090	527	127
9	-121	263	674	060
10	010	136	-056	-058
11	-181	083	056	025
12	529	-125	299	001
13	462	-113	428	-036
14	496	126	-041	-013
15	403	110	-082	-020
16	758	-005	522	070
17	717	-022	508	-030
18	204	962	283	-208
19	284	297	060	-165
20	005	602	232	-131
21	471	433	-037	-066
22	078	581	347	173

(Note - Decimal points are omitted)

Factors I and III are rotated through 150°

Factors I' and II are rotated through -35°

Factors I'' and IV are rotated through -73°

Table 14

Varimax Rotation

		Factors			
		I	II	III	IV
1.	Cartoon Predictions (CBI)	686	-138	379	335
2.	Social Translations (CBT)	-476	-475	796	-388
3.	Missing Cartoons (CBS,CBU,CBI)	105	331	945	-220
4.	Expression Grouping (CBC)	-192	708	279	785
5.	Picture Exchange (CBT)	524	359	241	367
6.	Missing Pictures (CBS)	-393	779	201	-117
7.	Squares Test (CFT)	-136	971	418	-130
8.	Hidden Figures A (NFT)	-219	328	-465	-152
9.	Hidden Figures B (NFT)	222	-160	457	754
10.	Concealed Words A (CFU)	-232	-127	175	164
11.	Concealed Words B (CFU)	290	287	425	275
12.	Vocabulary A (CMU)	-855	734	206	-215
13.	Vocabulary B (CMC)	101	-194	-197	675
14.	Alternate Uses (DMI)	-233	971	254	161
15.	Apparatus Test (CMI)	285	468	251	210
16.	Henmon Nelson (CMU)	109	167	697	-184
17.	I. Q. (CMU)	671	333	251	505
18.	Progressive Matrices Total	-359	-639	266	-149
19.	Matrix B (CFU, CFR)	-277	206	451	209
20.	Matrix C (CFT, NFR)	-100	611	866	-118
21.	Matrix D (CFT, NFR)	734	425	-146	482
22.	Matrix E (EFT, NFT)	-318	-270	-400	-157

(Note - Decimal points are omitted)

CHAPTER VI

DISCUSSION

Guilford's structure of intellect model was broadened in 1958 to include the behavioural content category. To date the construct of cognitive behavioural abilities has received confirmatory evidence in the factor-analytic research by O'Sullivan (1965).

The model itself has been established through attempts to use homogeneous populations and univocal tests. Guilford believes in using at least three tests for each factor so as to overdetermine that factor. He further believes in using a wide variety of such groups of tests so as to ensure the separation of all the common factors represented in the test battery.

O'Sullivan constructed twenty-three experimental tests for the purpose of identifying and measuring the six hypothesized cognitive behavioural products (CBU, CBC, CBR, CBS, CBT and CBI). Other reference tests were added to the test battery. These together with Mental Age and Chronological Age made up a total of fifty-two variables. Forty-seven tests produced intercorrelations from which she extracted all the eighteen factors she had hypothesized including six factors apparently of behavioural intelligence. With a large number of tests available and using a mixed population of boys and girls at grade eleven, O'Sullivan was thus able to produce some evidence for the validation of the construct of cognitive behavioural abilities. It should be noted that O'Sullivan had been fortunate in that she was given access to a considerably large population of 240 eleventh graders. She was also given adequate testing time to administer some 50 tests. Furthermore, she was fortunate to have enough reference tests which were directly applicable to her population. An experimental version of six tests measuring four cognitive behavioural products has been produced. The six tests are; Expression Grouping (CBC), Missing Pictures and Missing Cartoons (CBS), Picture Exchange and Social Translations (CBT), and Cartoon Predictions (CBI). The excessive cost involved in producing more reliable versions of all her test material led her to focus her attention on six of the cognitive behavioural tests only.

The present study attempts to provide further evidence for the validation of the construct of cognitive behavioural products by concentrating on a younger population of eighth graders. It was not possible to replicate fully O'Sullivan et al's work due to various reasons. The six tests available in the experimental version of O'Sullivan limited the present study to an investigation of only four cognitive behavioural products. In addition, limitation on testing time and the non-availability of established reference tests at the eighth grade level reduced the number of reference tests selected.

As a measure to overcome the shortage of suitable reference tests, special use was made of the Progressive Matrices Test. It was hypothesized in this study that Set B of the Progressive Matrices Test would be mainly a measure of CFR, Sets C and D would probably be a measure of CFT and NFR, and Set E would be a measure of EFT and NFT. The total score would most likely to be a measure of CFR and CFT. Hence the four sub-tests were used as separate reference tests with separate time-limits. It was also hypothesized in the present study that the two parts A and B of the Mill Hill Vocabulary test measure different factors. Part A (vocabulary test) had been hypothesized to measure CMU, whilst Part B (synonyms test) had been hypothesized to measure CMC. This use of separately timed parts had been advocated by Guilford (Guilford 1963a).

Advantage was taken of the fact that testing was part of the routine of the school guidance program. For the purpose of this study, the population was chosen from a school which had already administered the Henmon Nelson test (CMU), and which proposed to administer the DAT, one sub-score of which was Mathematical Reasoning, a marker test for CMS. Unfortunately the school could not administer the DAT until the end of the school year and the results would be available only in September. Tenopyr (1967) who attempted to obtain further information relative to the construct validity of some of O'Sullivan's tests of behavioural cognition, using a population of ninth graders, made similar use of the services of the school guidance program. She chose a California school which had records of the students' scores on the SCAT (the school and College Ability Test) and the STEP (the Sequential Tests of Educational Progress). This strategy, too, could be deduced from Guilford's work (Guilford 1952).

Following the application of the six experimental tests to an eighth grade population, the t test revealed that each mean score was significantly different from the chance mean score. The higher mean scores would be evidence that each test measured some kind of ability or abilities, as would the tabulation of mean scores of populations of different ages, for mean score was shown to increase with age.

The item analysis yielded point biserial correlations between items and sub-test total. Using a point biserial correlation of .30 as the standard, items that required improvement were listed for each of the six tests. In general, probably more than half of all the items, yielded point biserial correlations which were too low. The test length forcast showed test 2 (Social Translations) to be most susceptible to improvement through lengthening, and test 5

(Picture Exchange) to be least susceptible to improvement through lengthening. If such tests were to be used at the eighth grade, much improvement would be necessary.

Fortunately factor analyses can be employed with tests of low reliability. The principal component analysis yielded four significant factors. The fifth factor was retained for purposes of interpretation. Guilford believes that significance tests for factors are not sufficiently liberal.

Accepting the conventional practice of taking into consideration only factor loadings that exceeded .30, the factor pattern showed indications of what the six experimental tests did not measure. Whilst the six tests had loadings on unrotated Factor I, they were not involved in the two contrasting groups of factor loadings on Factor II, the highly verbal loadings and the highly figural loadings; they had no significant loadings on Factor III which seemed to be an NFT factor; tests 1, 2, 3 and 5 had no significant loadings on Factor IV which involved figural content. If Factor V was interpretable, it was a factor measured by marker tests 10 and 11 which were introduced as reference tests for CFU. Therefore, it could be inferred that the abilities measured by the six experimental tests are probably, in terms of Guilford's structure of intellect model, behavioural abilities.

Analysis of the sign pattern of the loadings classified the 22 test variables into 9 groups. Tests 1, 2, 5 and 6 were independent of others; test 3 formed a separate group and test 4 formed another separate group. Computation of "coefficients of belonging" showed tests 1, 2, 3, 5 and 6 to be independent of all the other tests, and test 4 formed a separate group. Hence the two methods of grouping provided evidence supportive of the interpretation of the unrotated factors.

Orthogonal rotations too, provided some evidence for the existence of the cognitive behavioural dimension especially when the fourth factor was rotated against the first so as to maximize a known factor content of the first factor. On the other hand, a varimax rotation rendered the pattern uninterpretable. Although the varimax rotation method is presumably a more objective method compared to other orthogonal rotations, as O'Sullivan had noted, a typical varimax solution was not suited to an examination of her hypotheses. Guilford, too, has come out strongly in favour of graphic rotations performed with some psychological skill in preference to varimax or quartimax rotations. (Guilford 1963a). Thus there is much evidence in favour of a cognitive behavioural dimension of ability at the eighth grade level, using the O'Sullivan experimental tests. But it was not possible to assign to the six tests four factor loadings suggested by her. (O'Sullivan & Guilford 1966). To be able to do so would require many more tests, particularly of a "marker variety", despite Guilford's suggestion that a skilled factorist can make use of even a single reference test (Guilford 1963a). This lack of test may account for all the cognitive behavioural factors being compressed into one "single" factor loading. O'Sullivan suggested that her six tests could best be used, at the eleventh grade, to measure CBS, CBT and possibly a Social-Cognition Aptitude composite. At the eighth grade this may have arisen as an artifact of the reduced number of tests in the battery. It remains to be seen whether better separation into separate factors of CBC, CBI, CBS, CBT would result from a larger test battery.

Guilford was of the opinion that the establishment of the hypothesis of cognitive behavioural abilities would have important implications for all those individuals who deal most with other people, such as teachers. The investigation of the implications of the cognitive behavioural product area for the selection of teacher-trainees would rest on the assumption that the cognitive behavioural abilities exist and are relevant for the teacher occupation. These abilities may be related to age or to occupation or to both. It would be necessary, therefore, to demonstrate that teachers as an occupational group obtain higher scores on the cognitive behavioural tests than any other occupational group similar in age, sex, educational level and socio-economic status. To get access to such comparable groups would be very difficult.

If the mean score on the cognitive behavioural tests obtained for the teacher population is higher compared to the mean scores obtained for the eighth graders, ninth graders, tenth graders and eleventh graders, it may be concluded that the tests measure some kind of ability, and one postulates that they would be cognitive behavioural abilities. If the cognitive behavioural abilities are relevant for the teacher occupation, teacher-trainees who are tested at each successive stage of training, would show increases in their test scores at successive stages. Using some criterion measures of teacher proficiency such as school inspectors' assessments, teachers can be categorized into successful and less successful ones. A successful teacher presumably would score more highly than a less successful colleague. It should be noted that the increase in test scores after training may be an indication of an increase in ability or merely of an increase in scores. It would therefore be necessary to demonstrate that teachers who show an increase in test scores after training also show an increase in teaching proficiency.

On the basis that increased training can increase the behavioural abilities involved, the detection of such abilities in younger students will have important implications for vocational guidance counsellors. Cognitive behavioural abilities have been demonstrated to exist in the eleventh graders (O'Sullivan), in the tenth graders (Guilford), and in the ninth graders (Tenopyr). There is evidence in the present study which indicates the existence of such an intellectual domain in children as young as the eighth graders. If early detection and guidance is necessary for future occupational success, then the existence of cognitive behavioural products at the grade eight level, the selection of individuals with high scores on these abilities, and their subsequent development are all important topics for teacher training programmes.

CHAPTER VII

SUMMARY AND CONCLUSION

The behavioural content category is the most recently evolved dimension in Guilford's structure of intellect model. Guilford hypothesizes six distinct cognitive behavioural products; CBU (cognition of behavioural units), CBC (cognition of behavioural classes), CBR (cognition of behavioural relations), CBS (cognition of behavioural systems), CBT (cognition of behavioural transformations), and CBI (cognition of behavioural implications).

In an attempt to identify and measure these six hypothesized factors, O'Sullivan (1965) applied the twenty-three tests which she constructed and also twenty-four marker tests on 240 eleventh graders. All the factors that had been hypothesized were extracted, thus providing confirmatory evidence for the construct of cognitive behavioural products.

The present study attempted to provide further evidence for the validation of the construct of cognitive behavioural products, using a younger population of 182 eighth graders who were homogeneous with respect to age and mixed with respect to sex. The experimental version of O'Sullivan's six cognitive behavioural tests was used hence limiting the investigation to only four categories. (CBC, CBS, CBT and CBI). In addition, severe limitation on testing time and the non-availability of established reference tests at the eighth grade level played a part in reducing the number of reference tests selected. The test battery consisted of six experimental tests and sixteen reference tests.

The characteristics of the experimental tests were; they were short and had low reliability. If the tests were to be of any practical value, in terms of reliability and validity, a good deal of work would have to be done on them. The item analysis data obtained gave indications of the various items that needed improvement. The test length forecast was also computed by using the Spearman-Brown formula for criterion reliability of .90.

The t test was employed to find out whether or not the mean scores were significantly different from the chance mean scores. The higher mean scores was an indication that each test measured some kind of ability or abilities; confirmation was also obtained from the tabulated means of ninth graders, tenth graders and eleventh graders.

All correlation coefficients of less than .195 were considered non-significant at the .05 level. The large number of non-significant correlation coefficients and zeros in the matrix might be taken as evidence for the non-existence of g.

After iteration, communality estimates were determined and a principal component analysis yielded four significant factors from the twenty-two test variables. The factor pattern showed indications that the six experimental tests did not measure the same abilities as those measured by other reference tests.

For further evidence, other methods were resorted to. With the method of sign pattern and the method of "coefficients of belonging", there was evidence that the six experimental tests form groups distinct from all the others.

Orthogonal rotations by hand, two axes at a time, were carried out. Two methods of rotating the axes were used; the first method required maximizing the loadings on what was believed to be the major reference (or experimental) factor, doing that successively for each factor, and then examining what was left of the first factor; in the alternative method, each factor was in turn rotated with the first factor, and the last rotation involved the remaining variance of the first factor and that factor with the highest loadings on the experimental tests. Both methods provided some evidence for the existence of what might be behavioural abilities.

The varimax rotation did not seem to yield any interpretable factor pattern. The rotation divided the loadings of the six experimental tests among Factors I, II, III and IV.

Based on the results of the various methods of analysis, the inference was made that substantial proportions of the variance of the six experimental tests may be attributed to abilities which, in terms of Guilford's structure of intellect model, may well be cognitive behavioural abilities. Given the small number of subjects and the fact that the tests have low reliabilities at the eighth grade level, it would be impossible to get a clear confirmation of Guilford's hypothesis. However, future research may provide the tests necessary to overdetermine each of the six hypothesized cognitive behavioural product factors. Some educational implications of these results were considered, in terms of teaching success and teacher training as well as vocational selection and early vocational guidance for future teachers.

APPENDIX A

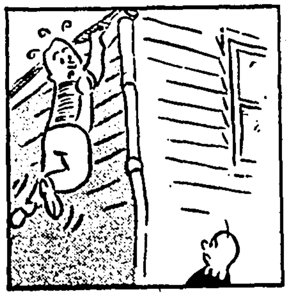
DO NOT WRITE ON THIS BOOKLET

CARTOON PREDICTIONS
Form A

Maureen O'Sullivan and J. P. Guilford

In each item of this test, there is a cartoon showing people's reactions in a situation. After deciding what the intentions or feelings of the cartoon characters are, you are to choose the one of three cartoons which shows what will happen next.

Look at sample item 31.



31

31   1   2   3

In the given cartoon, Barney, the bald-headed man, is frightened and is asking his son for help. The boy is upset by his father's predicament. The space under number 1 is blackened to indicate that alternative 1 is the correct prediction to make from this cartoon. The boy and his mother would help Barney get down. Neither alternative 2 nor 3 is correct. Since Barney looks frightened and helpless, it is unlikely that he could climb to the roof. The boy looks upset, so he and his mother would not laugh at Barney.

Remember: you are to predict what will happen on the basis of the thoughts, feelings, or intentions of the cartoon characters involved. Do not choose an alternative only because it is "funny." Mark your answers on your answer sheet.

This test has two parts, of 15 items each. When you reach the end of Part I, stop until you are told to go on to Part II. You will have 4 minutes to work on each part. Work as rapidly as you can. Do not spend a long time on any one item.

If you have questions, ask them now.

Stop Here

WAIT FOR FURTHER INSTRUCTIONS

DO NOT WRITE ON THIS BOOKLET

SOCIAL TRANSLATIONS
Form A

Maureen O'Sullivan and J. P. Guilford

In this test you will be given a statement. You will also be told who said the statement to whom. You are to choose another pair of people between whom the same verbal statement will have a different meaning or intention.

Look at sample item 25.

---

25. boss to secretary	1) beggar to stranger
	2) father to son
"Please."	3) chauffeur to boss

---

1 2 3
25

In sample item 25, a boss saying "Please " to his secretary is a statement of courtesy. A father saying "Please " to his son or a chauffeur saying "Please " to his boss is a similar, polite statement. However, if a beggar were to say "Please " to a stranger, the statement would have a more emotional, imploring meaning. Since the statement "Please " made by a beggar to a stranger has a different intention than "Please " said by a boss to his secretary, alternative 1 is the correct answer.

REMEMBER: you are to choose the pair of people between whom the given statement will have a different intention or meaning. Mark your answers on your answer sheet.

This test has two parts, of 12 items each. When you reach the end of Part I, stop until you are told to go on to Part II. You will have 4 minutes to work on each part.

If you have questions, ask them now.

Stop Here

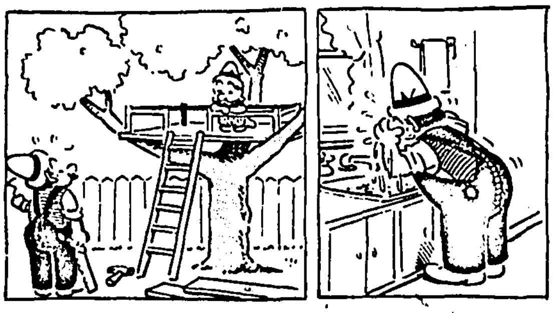
WAIT FOR FURTHER INSTRUCTIONS

MISSING CARTOONS
Form A

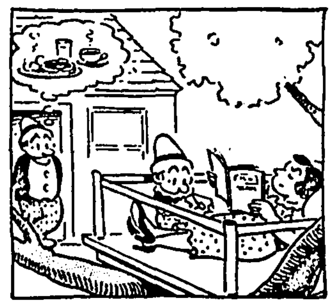
R. deMille, Maureen O'Sullivan, and J. P. Guilford

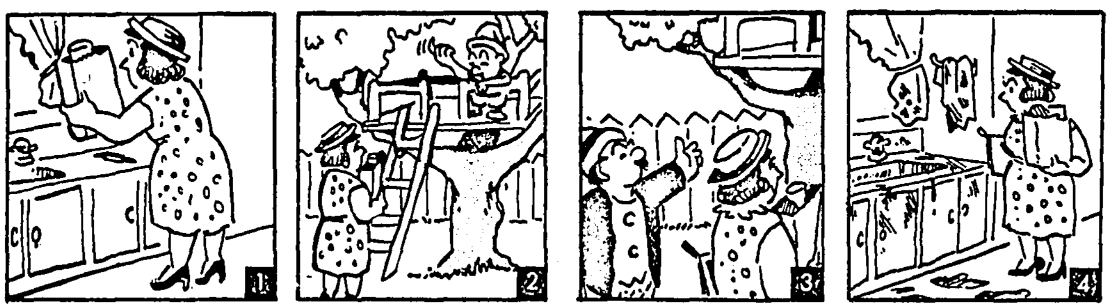
In the "Ferd'nand" cartoon strip shown below, the third picture is missing. The missing picture is among the four pictures in the second row. If you choose the right picture, the strip will make sense and the feelings and thoughts of the characters will all fit.

Look at sample item 29.



29





29 1 2 3 4

At the end of the story, Ferd'nand is upset and misses his dinner. The little boy is unconcerned. The mother is annoyed and is not making dinner. All these things are happening because Ferd'nand left the kitchen messy, which annoyed Mrs. Ferd'nand. Alternative 4, then, is the right choice. Pictures 1, 2, and 3 do not complete a series of four pictures that makes sense out of what the people are doing, thinking, and feeling.

In each item that follows, find the picture that completes the story and blacken the right space for that item on your answer sheet.

This test has two parts, of 14 items each. When you reach the end of Part I, stop until you are told to go on to Part II. You will have 8 minutes to work on each part.

If you have questions, ask them now.

Stop Here

WAIT FOR FURTHER INSTRUCTIONS

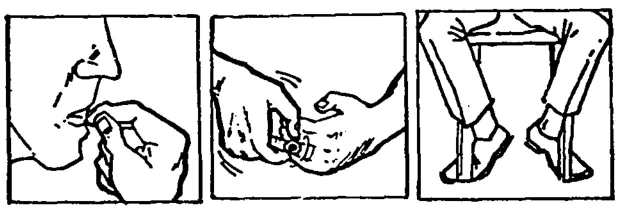
DO NOT WRITE ON THIS BOOKLET

EXPRESSION GROUPING
Form A

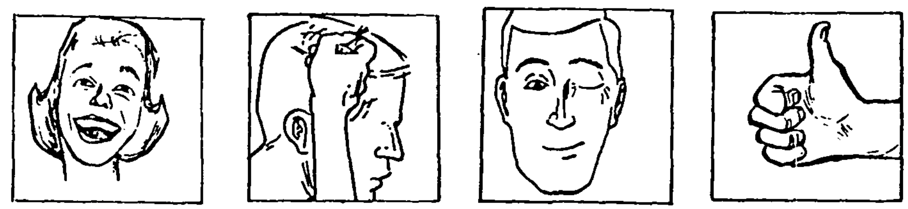
Maureen O'Sullivan and J. P. Guilford

In the sample item below, the three pictures at the left all go together because they stand for one kind of thought, feeling, or intention. One of the pictures at the right also belongs with them, since it shows the same expression.

Look at sample item 31.



31



1 2 3 4

31 1 2 3 4

The space under number 2 has been blackened because picture number 2 expresses the same kind of feeling, of tension or nervousness, that is shown in the three pictures at the left. Pictures 1, 3, and 4 show people who are enjoying themselves and are not tense or nervous.

For each item in this test you are to choose the expression that belongs with the three pictures grouped at the left. Mark your answers on your answer sheet.

This test has two parts, of 15 items each. When you reach the end of Part I, stop until you are told to go on to Part II. You will have 5 minutes to work on each part.

If you have questions, ask them now.

Stop Here

WAIT FOR FURTHER INSTRUCTIONS

DO NOT WRITE ON THIS BOOKLET

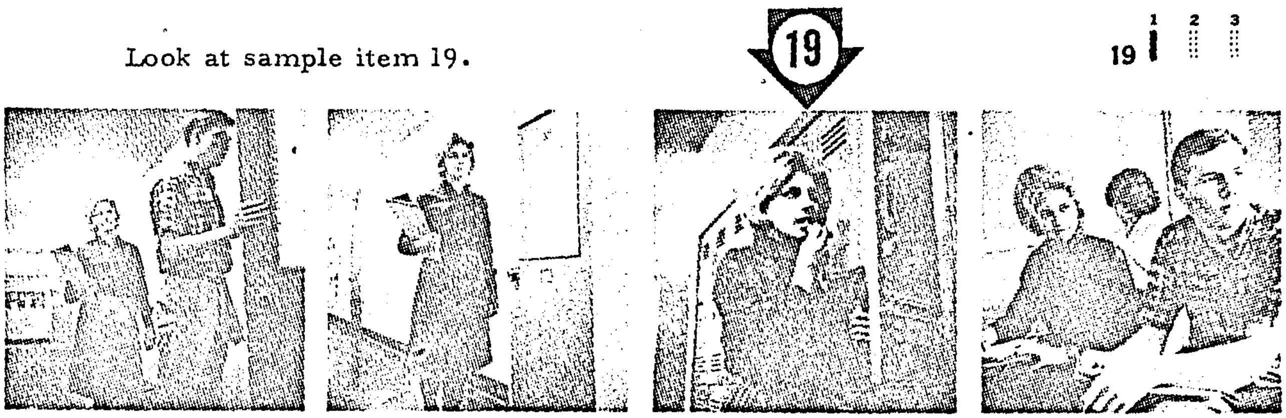
PICTURE EXCHANGE
Form A

Maureen O'Sullivan, R. deMille, and J. P. Guilford

The first row of pictures below tells a story. The third picture 19 is to be replaced by one of the three pictures in the second row. If you choose the right picture, the meaning of the story will be changed. Neither of the two wrong choices will change the meaning.

Look at sample item 19.

19 1 2 3



The girl in the story wanted to make a good impression on the boy, so she touched up her lipstick before going to sit in the class with him. In alternatives 2 and 3 she is still making herself more attractive, and so the meaning remains the same. But in alternative 1 she is only getting her book from her locker. She may still be interested in the boy, but she is not trying so hard to make a good impression. Alternative 1 has been marked as the correct choice for item 19.

In each item that follows, notice where the arrow is. Then find the substitute picture that will change the story by changing the thoughts and feelings of the people. Blacken the right space for each item on your answer sheet.

This test has two parts, of 9 items each. When you reach the end of Part I, stop until you are told to go on to Part II. You will have 6 minutes to work on each part.

If you have questions, ask them now.

Stop Here

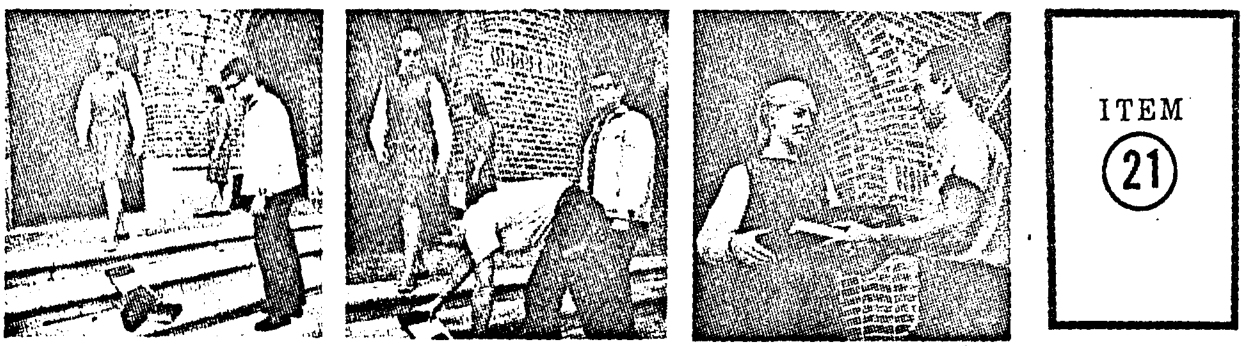
WAIT FOR FURTHER INSTRUCTIONS

MISSING PICTURES
Form A

Maureen O'Sullivan, R. deMille, and J. P. Guilford

The first row ' pictures below is meant to tell a story, but one of the pictures has been removed. The missing picture is among the three pictures in the second row. If you choose the right picture, the story will make sense and the feelings and thoughts of the people will all fit.

Look at sample item 21. 21 1 2 3



The boy wearing glasses wanted to pick up the books for the girl, but the other boy beat him to it. As the conclusion of the story, alternative 3 makes sense. He feels disappointed. There is no reason for him to feel happy, as in alternative 2, and no reason for him to drop his own book on the steps (alternative 1). Alternative 3 has been marked as the correct choice for item 21.

In each item that follows, find the picture that completes the story (it will not always be the last picture) and blacken the right space for that item on your answer sheet.

This test has two parts, of 10 items each. When you reach the end of Part I, stop until you are told to go on to Part II. You will have 6 minutes to work on each part.

If you have questions, ask them now.

Stop Here

WAIT FOR FURTHER INSTRUCTIONS

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