A STUDY OF CO-OPERATION IN PROBLEM SOLVING BETWEEN CHILDREN OF DIFFERENT INTELLIGENCE LEVELS.

by

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ABSTRACT

The research described in this thesis deals with a topic that has received rather little attention in recent years, namely, co-operative problem-solving behaviour in young children. Owing to a lack of previous data the experiment was necessarily exploratory in nature and 78 children, drawn from 3 different schools participated. Each child was required to solve 2 kinds of problem under 3 conditions - (a) on his (or her) own, and (b) with a partner of the same M.A. and C.A., and (c) with a partner of the same M.A. and different C.A. The tasks were roughly equated for difficulty and the intention was to compare the children's performance under the 3 different conditions.

In view of the increasing popularity of Bales' method of analysing Interaction Processes it was decided to adopt and at the same time to test his system in the present experiment. For reasons that will be clear in the main discussion it was also decided to introduce an additional "concentration" category in order to render the data more meaningful.

An important but unexpected finding was that the Bales' system of categories shows serious weaknesses when applied to young children and full particulars of these are elaborated in the main discussion. Because of these weaknesses in the Bales technique the results are less conclusive than they might have been. Nevertheless a detailed statistical analysis of the data strongly suggests that if a child is made to work [willingly or otherwise] in partnership with a child of a different age, the main effect is to bring about rather sharp changes in what Bales describes as the "negative emotional areas". In other words it is patterns of hostility rather than patterns of co-operation and task involvement which are most

affected by the different kinds of pairing.

In particular there is evidence that it is generally more disturbing for a child to be paired with an older partner than with a younger. However, even this tendency appears to vary for different ages and considerable individual differences appear to be present. For instance one child may welcome the opportunity to show off in front of a younger partner whereas another child may regard a younger partner as a nuisance or even as a threat (if there is any possibility of the younger partner solving the problem first). These and similar problems are discussed in some detail in the main discussion.

Finally, consideration is given to various methodological difficulties. Apart from all the usual difficulties due to uncontrolled variables etc. a special difficulty arises from the fact that Bales' system breaks down the interaction process in a rather artificial way. It will accordingly be argued that there is definite scope for broader and psychologically more meaningful categories such as the present writer's "concentration" category. Yet another difficulty arises from the possible complaint that the experimenter's co-operative situation is too artificial to be legitimately described as "co-operative". This complaint about artificiality is one that all social researchers have to meet. In this particular experiment it can be met by showing that the experimental situation does indeed conform to the various definitions that other theorists have given to the concept of co-operation.

To

the memory of

my beloved Mother

Monserrate Weber Nazario

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I. STATEMENT OF THE PROBLEM

It may be noted that, in spite of the rapid development of social psychology in recent years, relatively little attention has been given to the problem of co-operation. The fact that sociologists study the laws of evolution and the organisation of society suggests that they might have been greatly influenced by the application to human affairs, especially in the middle of the nineteenth century, of what was popularly understood to be the Darwinian theory of progress. In consequence, more emphasis has been placed on another aspect of social behaviour, namely competition. To the writer's mind, however, it is not sufficient to relate competition to co-operation or to recognize the overlapping between the two. Co-operative social behaviour is as old as life itself, and the direction of evolution must be increasingly directed towards the fuller development of co-operative behaviour. The possibilities of friendly co-operation unpremised on competitive motivation have not been fully worked out, and so they provide fresh avenues for further exploration.

Social psychologists, on the other hand, in their effort to study the individual in the group, have had to attend more closely to individual differences in the evaluation of their "friendly companionship", and to the importance of this for the survival and happiness of mankind. To them as well as to sociologists, the co-existence of so many different species of animals throughout the world is sufficient testimony to the validity of the principle of co-operation. It is probable that man owes more to this than any other species in his biological and social behaviour. His

needs are best satisfied in interaction with other individuals. As Ashley Montague (21) said, "No cell is more intimately bound to another than man is to his fellows and his social group". (page 267). Whenever and wherever human beings come in contact with each other, social adjustment, assuming the form of co-operation, takes place. This is a basic fact of social life, as basic as co-operative amiability is to human nature.

The field of social behaviour, greatly illuminated by recent investigations, is truly wide, with overlapping features in sociology and psychology of personality. One of its aspects is the extent of the individual's social participation, with the interests of the group as a whole as against those of any individual who is part of it. Sometimes the overlapping is great, at other times very little. In any case individual personality characteristics are bound to be important.

Attempts are made in the present study to understand and explain how individual behaviour is influenced by the presence of others. Considerations are made of the degree of co-operation manifested and the ease with which the individual adapts to others. The questions to which the writer has set out to find the answers are reduced to the following general terms:

(a) How do children of different intelligence levels react when attempting to co-operate in a task?

(b) What psychological and social problems arise in their co-operative activity?

(c) What are the measurements for the evaluation of a child's social

participation as compared with his own individual performance?

The subjects used were children with the same mental age and different chronological ages working together in pairs.

The line of investigation runs through recognized aspects of co-operative behaviour such as: quality of performance and time efficiency between a child performing alone and when working with another; manifestations during group performance of positive and negative emotional areas, namely: friendliness, acceptance, confidence, hostility, antagonism, anxiety, rejection, etc.

The experiment relied chiefly on objective methods which, in recent years, have been increasingly made use of in the study of social phenomenon, providing reliable "conceptually meaningful" data in field studies. The writer is, however, aware of the limitations of this method. First, there is no doubt that a certain loss of content results when the behaviour is converted into symbolic transcript. Second, rapidity of interaction sometimes makes it impossible to discern the occurrence of certain forms of interaction. Extra efforts have to be taken to follow the sequence of such interaction and to cover the widest possible range of interacting behaviour.

In order to present the qualitative social interaction in manageable form, the behaviour has been coded in twelve separate categories devised by Bales (3, 4, 5). To these, however, one category is added designed in such a manner as to state more clearly the bearing of the individual's behaviour directly to the task and the social and emotional relationships which arise out of the individual's contact with each other. This will

be designated the concentration or "C" category. This method, although useful, has certain limitations which perhaps limit the rating and scope of the findings. The problem of measurement is an important one in the exploration of this particular field of co-operative behaviour and may provide a starting point for the better understanding of the psychological processes involved.

In the section which follows this, the background of the study is explored in detail; this is followed by a full description of the method of investigation used in this study.

II. BACKGROUND AND LITERATURE

A definition constitutes a limited effort to formulate the essential properties of a concept. It is always incomplete. The basic requirements of clarity, exactness and precision are frustrated by several factors. Owing to shortage of time or space, one is usually obliged to consider only superficially a concept or to include only some principal qualities. The vagueness or complexity of the concept to be defined is another obstacle - it is easier to define book than liberty because the former concept is capable of objective definition. For a definition to be adequate ideally involves a complete knowledge of the nature of the thing defined. And of what subject of scientific interest can we flatter ourselves to have complete knowledge? Language with all its possibilities still leaves unbridgeable gaps between definer and hearer; their experiences are never the same. Nevertheless, definitions of some sort are psychologically needed: we must know what things are, at least to know enough about what we are discussing. Besides, in everyday life one is always defining, really simplifying, in order to be understood.

As Klugman (14) has observed, co-operation is a concept of which many definitions have been given. For instance, it has been defined by some writers as a kind of group competition or rivalry. Others interpret it as a social facilitation in which individuals are stimulated to do better work simply because of the presence of other workers. Still others have thought of co-operation as pooled independent judgement, although Preston (23) speaks of "judgements which are a consequence of the interaction of viewpoints".

Extensive writings on co-operation and competition had been done by May and Doob (17) up until 1937. They distinguish between co-operation and competition in the following manner: "Competition or co-operation is directed toward the same social end by at least two individuals. In competition, moreover, the end sought can be achieved in equal amounts by some and not by all of the individuals thus behaving, whereas on co-operation it can be achieved by all or almost all of the individuals concerned". (page 6).

Mead's (19) survey of co-operation and competition among primitive people includes the following definition: "Competition is the act of seeking or endeavouring to gain what another is endeavouring to gain at the same time" and co-operation "The act of working together to one end".

Mead contends that a distinction should be made between "competition" and "rivalry", and also between "co-operation" and "helpfulness". "Competition is behaviour oriented toward a goal in which the other competitors for the goal are secondary; rivalry is behaviour oriented toward another human being, whose worsting is the primary goal". In co-operation, "the goal is shared and it is the relationship to the goal which holds the co-operating individuals together; in helpfulness, the goal is shared only through the relationships of the helpers to the individuals whose goal it actually is". According to Mead, co-operative behaviour is more the result of social and cultural influences than of basic characteristics of human personality. In some cases of course, co-operative behaviour is no more than a routine manifestation of intelligence.

In much the same way Maller (16) defines a co-operative situation as one which stimulates an individual to strive with the other members of his group for a goal object which is to be shared equally among all of

them. On the other hand, a competitive situation is one which stimulates the individual to strive against other individuals in his group for a goal object of which he hopes to be the sole or principal possessor.

Barnard (6) traces the origin of co-operative action to the individual's "own biological limitations". He continues that "The most effective method of voercoming these limitations has been that of co-operation. This requires the adoption of group, or non-personal purpose".

Helen Black Lewis (15) suggests as "the minimum requirement for co-operative behaviour a diminution of ego demands ..... for a truly co-operative work is one in which personal needs can function only if they are relevant to the objective situation; the common objective, in other words, is more important than any personal objective ..... since the self is not focal, another person's activities - the co-operating person's - may be as satisfactory as your own ..... Competing for individual rewards (individualistic competion) on the other hand, involves a heightening of ego - demands, so that the ego objective is more important than any common objective; the individual is 'on the spot' - so that similar behaviour may be expected from the member of the competing group and the person driven by ambition. Competing behaviour involves seeing the objective situation as relevant to the personal need to win or for prestige. Only personal activities therefore can be satisfactory". (pages 115-116). It seems to the writer that it is likely that all social perceptions and expectations involved ego forces in their organisations. Thus, the explanation of the behavioral adequacy of inadequacies of our social perceptions and expectations requires an insight into the nature of object - ego relationship and an understanding

of how these relationships are acquired.

Harding (10) says, "there is co-operation when several people join together to carry out intentions formulated by one of them, or held independently by them all". He further observes co-operation of a special kind which is implied in the so-called integrative behaviour involving genuinely mutual influence in the arrival at the aim itself as well as the methods of carrying it out. "Competition", he says, "is the effort to do better than others in the same scramble". He adds, "We always compete for something we desire - money, power, security and so on ... The motive is the desire for what successful competition brings, not the desire to compete".

Morton Deutsch (7, 8) refers to a "co-operative social situation as one 'promoting interdependent goals'" - a goal region can be entered by any given individual or sub-unit only if all the individuals or sub-units under consideration can also enter their respective goal region. And to a competitive social situation as one "contriently interdependent goals - if a goal region is entered by any individual or sub-unit, the other individuals, to some degree, will be unable to reach their respective goals in the social situation under consideration". Implicit in most of these conceptualizations has been the notion that the crux of the difference between co-operation and competition lies in the difference in the nature of the goal regions in the two situations.

Argyle (2) runs in the same lines. He says, "By a co-operative group is meant a group in which the members help one another to reach some joint or group goal. In a competitive group the members are concerned with private and mutually exclusive goals: the goal is limited,

so that if one member reaches it others cannot". (page 128)

Another definition which has been stated briefly but effectively, is that of Katz (13). "Co-operation ..... describes a joint co-ordinated effort by two or more individuals". Folsom (9) and Warren (26) hold to a similar point of view.

The elements which appear to be common to all the definitions cited provides the starting point in the investigation which the writer has set out on. Co-operation consists of two words: co - that means together, and operation to operate, or to work. Implicit here is also the notion of a common purpose. In this study, co-operation is therefore interpreted as the action of co-operating, of working together toward the same end, purpose or effect.

Co-operation surrounds us on all sides. At every working hour we co-operate with others in countless ways. Because of its pervasiveness and continuity, co-operation is a process of which we are likely to be least aware, many co-operative acts have come to be taken for granted. It has no clear operational basis. No doubt because there are many different senses in which people might be said to co-operate. Two persons can co-operate while doing vastly different tasks. Members of a navy are often said to be co-operating although their activities differ in nature, time and place. Conversely, individuals engaged in common activities at the same time and place are not necessarily engaged in a co-operative process. In its popular and scientific usage, co-operation is a "catchall" for many types of activity. It combines significant differences in social actions that should be noted rather than ignored: they differ widely. Nevertheless, the term co-operation

is popularly appropriate to all interactions. As a means or an end it never occurs in its pure form, but is almost always accompanied by an element of competition.

Competition is not a simple expression of the individual's selfish and anti-social tendencies. In popular usage it refers to more than social interaction. It is a term in social theory which associates the fact of a struggle with the function of order. It is commonly used to denote a struggle or contest in which one individual strives to equal or surpass another or obtain certain objects. It is indeed the key word for prestige and income, for power and wealth. It is by competition - whether of persons, nation, races, cultures, beliefs - that the "fittest survive".

Co-operation in the sense of working together for a common result is as old as human nature. To co-operate is to proceed together to a mutual end, conscious or unconscious. It is always a matter of individuals making up a group, a group being understood as a gathering of people or a social system. But as there are many ways of defining a group, for the convenience of this study, the writer chooses to circumscribe it within any aggregate consisting of two or more persons who are assembled to perform a task.

Co-operation is of necessity a form of social behaviour - the most continuous of the social processes - although all social behaviour is not necessarily co-operative. Co-operation and competition are, as a point of fact, two interrelated factors that are continuously present in all interpersonal or inter-group relations. They have many elements in common, and activities which outwardly appear to be competitive or co-operative may have different and quite mixed motives behind them. Although we often think of competing and co-operating as opposites, this is not necessarily

the case, for it often happens that both are parts of a larger project. Both co-operation and competition can be efficient means to the same end. Many competitive games involve more co-operation than competition, just as many co-operative ventures entail a good deal of competition between individuals who are joined in a common interest. Needless to say, both factors are of great significance for understanding and the control of social processes. Thus, few or probably no real life situations are "purely" co-operative or "purely" competitive. Most situations of everyday life involve a complex set of goals and sub-goals. Consequently, it is possible to be co-operative with respect to one goal and competitive with another. To illustrate, let us imagine ourselves with a ball game in an athletic field. Group A versus Group B. Each group is playing to win against the other, but there will be someone or other in either group that plays to compete in order to be the champion or star of the event.

In everyday life it is frequently very difficult to judge whether children are competing or co-operating. In connection with a class project, for example, one pupil may make a contribution primarily to promote the work at hand, while another child, or the same child at another time, may simply be trying to achieve recognition. Frequently, the underlying motive is difficult, or impossible, to assess, although the pattern of a child's behaviour from day to day often provides some clues. In passing we might note that the child who is not actively competing may nevertheless be highly competitive in his attitudes. His own standing may mean so much to him that he will not join in group activity for fear that he won't make a good showing.

In these examples, as in many others, we can see that the social interactive relationship ranging from co-operation to extreme forms of conflict really represent a social continuum. It is both through competition and co-operation that the individual finds himself, discovers his resources and tests his abilities. This, no doubt, confirms the fact that the one process gradually merges into the other. Because of its simultaneous occurrence, it is difficult not only to make an absolute distinction between competition and co-operation, but also to estimate the overlapping of the two forms of behaviour. It might be a matter of degree rather than of kind. At any rate, all human interactional relationships are potentially capable of all degrees of co-operation and all degrees of conflict, even to that kind of violence which leads to annihilation. Thus, co-operation as well as competition are firmly grounded in the psychology of social life.

An examination of relevant details of perceptible behaviour would probably help to clarify certain aspects of co-operative activity. Tear and Guthrie (24) making such an examination have arrived at the following verbal description of behavioural tendencies that are characteristic of the co-operative person:

1. Tolerant to others, that is, able to perceive the needs of others as well as his own needs.
2. Helpful. This means he is willing to help others when there is no immediate prospect of return for himself.
3. Identifies himself with the group, that is, he has a feeling of success when the group succeeds and a feeling of failure when the group fails.
4. Essentially in agreement with other members of his group. Conversely,

a person may be considered unco-operative if :

(i) He will do nothing to help; or if he does, he works by himself.

(ii) He is unable to consider the needs of persons other than himself.

(iii) He is more concerned with his own success or failure than with those of the group.

(iv) He will not readily adopt group ideas unless they are in accord with his own.

If one word were required to embody the essence of Society, that word is co-operation. Co-operation is a unique process of social psychology. To be a human being is to be a social being - this is our social inheritance. Our human relationship has, no doubt, its specific area of investigation - sociology. The human interrelations are based on doing things together; through co-operation. From here it follows that if civilization is to survive, this will be largely due to our ability to cultivate a sociology of co-operation.

Certain theories held by some investigators as to its origin, nature, and processes bear witness to its universality and great significance. The view of Ashley Montague (22) is that fundamentally the social nature of human beings has its origin in the physiological relationship between parent and offspring. It is in the nature of the reproductive process that we see the basis for the development of social life, and the suggestion is that social life may habe its roots in the satisfaction of basic needs. The impulses toward co-operative behaviour are already present in the individual at birth and all they require is cultivation. In other words, co-operation as a social behaviour is innate in the process of reproduction, a social, co-operative behaviour which is

simply an extension of the maternal - offspring relationship. The will to co-operate is deep seated in humanity and men are fundamentally co-operative as their basic emotional needs of mental love, security, belonging, status, success, adventure, and insight are largely satisfied by humourous relations in a social group. Furthermore, there is the obvious fact that intelligent beings are bound to realise that co-operation is in the interests of everyone.

Allee's (1) view runs along the same line. "Normally", he writes "the development of highly social life comes by way of an extension of sexual and family relations". "Here again all degrees of increased length of association can be shown, from the sexual forms that meet but once and for a brief moment, to the termite kings and queens that live together for years. Also all stages exist in the evolution of the association of parents with offspring, from insects such as the female walking stick, which deposits eggs as she moves about and pays no more attention to them, to the ants and bees whose workers' offspring spend their entire lives in the parental colony or some colony building off from it". (page 28).

The findings in a study by Mergert (20) are instructive in this connection. Two-year old children were observed when brought into a small playroom in pairs during twenty-minute periods. Each child in the study was paired with each of the other children. When responses were tallied, those which could be classed as overtly friendly outnumbered the overtly unfriendly responses by more than four to one; (the respective average scores were 89.5 and 20.5).

The proportions between friendly and unfriendly responses vary with

different children and in different situations, but it is significant that in studies of young children the balance has run strongly in favour of the friendly forms of behaviour. Indeed, even children who are quite outstandingly aggresive may show more friendliness than hostility.

In a study by Jersild and Fite (11) it was noted that two children were outstanding with respect to the relative frequency of their conflicts; in both cases, however, social contacts that did not involve conflict outnumbered those in which aggresions occurred. The fact that a child tends to be friendly rather than hostile in his initial response to a newcomer appears from a study by Wright (27). Children in this study gave desirable toys more frequently to strangers who were introduced into the experiment than to their own established friends. Of course it is possible that this desire to make friends may have been anxiety-motivated.

It is convenient at this point to summarize the arguments presented so far. In the opening paragraphs of Section I it was suggested that sociologists, under the influence of early Darwinism, have tended to lay too much stress on the competitive aspects of social behaviour. Under the Darwinian conception Man was taken to be basically self-centred and the temptation was to interpret all social phenomena as by-products of Man's attempts to further his own interests at the expense of others. As a corrective to this view it was suggested that Man's co-operative instincts are just as strong as his competitive instincts and that both kinds are continuously present in all social behaviour. In some senses this need not be regarded as a denial of the Darwinian position. Presumably a group of completely selfish individuals might still co-operate because it is in the interest of each member to do so. For instance, it is easy to see that primitive man might well have starved

or been killed if he had tried to catch deer or navigate fast-flowing rivers on his own. For reasons such as this it is plausible to assume that the evolving intelligence of Man was accompanied by an evolving awareness of the fact that desirable ends could often be achieved much better by co-operation than by competition. In this case it is to be expected that natural selections would operate to preserve those individuals who were disposed to strike an efficient compromise between competition and co-operation.

A difficulty of this argument, however, is that the terms co-operation and competition are sometimes given different definitions. For instance, the word co-operation is occasionally taken to imply a positive emotional relationship between the co-operating parties. Obviously the Evolutionary argument will be less convincing for some interpretations of the words co-operation and competition than it will be for others. As part of the Historical Background a number of definitions including the writer's own definition were considered. It was then shown that on these definitions there is empirical evidence that young children do indeed have natural tendencies to co-operate with one another. It is therefore now appropriate to pass on to a consideration of the qualitative differences in behaviour between the person acting on his own and the person acting in company with other persons.

Many authors, past and present, would agree that the interaction of individual minds produces a different manner of thinking, acting, and feeling and behaving from that of a single mind in isolation. This is capable of several different interpretations, these interpretations have often been regarded as attempts to solve the problem of the "group mind", and have been offered by sociologists, educationalists, philosophers,

anthropologists as well as historians.

The investigations in the field which are readily called to mind are those dealing with the efficiency of individuals employing the techniques of co-operative and competitive behaviour. The year 1879 saw the formal establishment of the first laboratory of psychology by Wundt at Leipzig. The first problem was formulated as follows: What change in an individual's normal solitary performance occurs when other people are present? The first laboratory answer to this question came from Triplett (25) in 1897. While examining the official records of bicycle races Triplett noted that a rider's maximum speed was approximately 20% greater when he was paced by a visible multicycle. Desiring to learn more about the matter, he set up an experiment with children in the age range of ten to twelve, giving them the task of winding fish reels. Alternating situations alone and together, he found that when working together, twenty of his forty subjects excelled their own solitary record, while ten did less work, apparently because they were overstimulated by the desire to win, and ten were essentially unaffected. All in all, he concluded that the group situation must normally be thought of as producing greater output of energy and achievement. His explanation is of interest. The bodily presence of other contestants participating simultaneously in the race serves to liberate latent energy not ordinarily available..... The sight of the movements of the pacemakers or leading competitors, and the idea of higher speed furnished by this or other means, are probably in themselves dynamogenic factors of some consequence. As we can see in this experimental design, as well as in his explanation, Triplett fails to distinguish two factors: emotional co-operativeness and

competitiveness on the one hand, and simple dynamogenic effect resulting from the sights and sounds of co-workers on the other.

In the year 1903 the findings of another pioneer investigation were announced. The method used was that of comparing the individual's mental work in the group with his performance when working alone. It was carried out by August Mayer (18). His subjects were fourteen boys from Germany. Their average age was twelve years. Five tests were selected as a means of measuring reasoning, memory, and imagination. The tests involved writing from dictation, mental arithmetic, written arithmetic, learning nonsense syllables and completing written sentences by supplying verbs which had been omitted. One pair of tests was given in the classroom to all fourteen boys working simultaneously, and the others to each boy separately. Three types of instructions were used in the various tests. The first was, "You are to finish quickly and yet do your work as well as you possibly can". The second "Go slowly but very carefully" and the third, "Be as quick as you can - quality does not count".

The results obtained pointed out a gain in the average quantity of work, fewer errors, greater uniformity and lower average deviation along scores in the group over the average done alone.

Klugman (14) carried out a similar experiment. The purpose of his study was to determine whether among children of average intelligence (I.Q. 90 - 109) two heads were better than one in the solution of 20 arithmetical problems, graduated in difficulty; that is, whether two children working together could do more problems correctly and in a shorter time than each child working alone. The ages of the children - boys and girls, white and coloured - were between 9 and 13 years.

The results indicated that when children worked in pairs not only did they earn reliably higher scores than when they worked independently, but also that they took a longer time in solving the problems.

Mention here is also made of the classic experiment carried out by Morton Deutsch (8). To be sure, he has put forward the most important theory in the field of co-operation and competition. His influence lies in the fact that his postulates give evidence directly related to his hypothesis concerning group functioning, and this formed the basis for the evaluation of his own theory.

In order to study the effect of co-operation and competition upon group process, ten experimental groups were established. Each group was composed of five Introductory Psychology Students who were participating in the experiment as a substitute for their regular class sections. All groups met for one period of three hours, at different times of the week, for six consecutive weeks. During the first week the ten groups were observed and rated as they discussed a human relation problem, the ratings of the discussion productivity were used to pair off equated groups. Five pairs were then formed. One group of each pair was then assigned by random procedure to the co-operative treatment, the other to the competitive treatment.

The "co-operative situation" was produced by a set of instructions which stated essentially that the group, as a whole, would be rated in comparison with the efforts of four other similarly constituted groups; the grade or reward that each member received would be the same and would be determined by the relative position of his group in contrast with the other four similar groups. The "competitive situation" was produced by another set of instructions which stated essentially that each member

would be rated in comparison with the efforts of the other four members comprising his group, the grade or reward that each would receive would be different and would be determined by the relative contributions of each to the solution of the problem with which they were confronted.

Apart from the differences in instructions, all groups were exposed to similar routines during their three-hour meetings. The first part of the meeting was spent solving a Sunday supplement type puzzle, the second part of the meeting was spent discussing and writing some recommendations for a human relations problem, and in the third part of the meeting the instructor-experimenter informally lectured on Psychology.

The practical implications of the results seem evident (to the extent that the results have any generality) that greater group or organizational productivity will result when the members or sub-units are co-operative rather than competitive in their interrelationships. The inter-communication of ideas, the co-ordination of efforts, the friendliness and pride in one's group which are basic to group harmony and effectiveness, appear to be disrupted when members see themselves to be competing for mutually exclusive goals. Further, there is some indication that competitiveness produces greater personal insecurity (expectations of hostility from others) than does co-operation.

A discussion of this is incomplete unless further mention is made of the work done by a social scientist - Bales (3) . His original monograph entitled "Interaction Process Analysis" is a stimulating progress report on the work he has been doing to date on this broad problem. The central purpose of this book is to provide a working manual for those interested in studying the interaction among small group members. Of all the related investigations cited, his is the most relevant to the

writer's work, as his techniques and measurements provide the necessary tools.

Bales' observation instrument is described as "a standard, general-purpose, set of categories for observation and analysis" rather than a series of special lists of categories, each particularly fitted for a particular kind of group. The categories are operational definitions of the main variables which may be involved in testing hypotheses about the behaviour of the group.

In Bales' categories the observer is asked to watch the frequency with which any member does the following :

1. Gives a suggestion.
2. Gives an opinion.
3. Gives orientation.
4. Asks for orientation.
5. Asks for an opinion.
6. Asks for a suggestion.

And in observing behaviour relevant to group problems in the emotional or social relationships among the members, the observer may look for behaviour in the following categories:

7. Shows solidarity.
8. Shows tension release.
9. Agrees.
10. Disagrees.
11. Shows tension.
12. Shows antagonism.

From the above Interaction Process Analysis is clearly a way of

documenting the behaviour of the members as the group swings from resolving their task tensions to meeting their social strains and back again to the task, and so on. It is this continuous and rapid and significant transition from one to the other which the present investigation attempts to measure by the objective methods worked out by Bales, but mostly from the point of view of co-operative interaction. This will be discussed more fully in the next section.

III METHOD OF INVESTIGATION

The main tool used in this study was Bales Interaction Process Analysis, the material analysed in this way came from pairs of children working on a common task. Bales method is described first, then details of the subjects, materials and procedure follow in turn.

The Results obtained took the form of time scores for each of the sub-tasks, success at the task and the recorded observations of behaviour. The observations were analysed in terms of the frequency of occurrence of various classes of behaviour.

a. Interaction Process Analysis

Interaction Process Analysis (IPA) is a method devised by Professor Bales of Harvard University for the study of small groups in face to face interaction. Professor Bales describes his system as a set of methods which are used to analyse the behaviour of groups characterized by diversity in composition, character, and purpose. He defines these small groups as those involving two to twenty individuals. In writing of these groups Professor Bales says:

> "Similarly, the term 'small group' is suggested to provide a convenient way of referring to the kinds of groups which have been or presumably can be studied by this body of methods. Concretely, these groups are very diverse in composition, character and purpose. Included in the referent are groups such as those formed for group discussion and group therapy, for counseling, planning, training programmes, and experimental teaching procedures. Policy forming committees, boards and panels, diagnostic councils in clinical work,

problem-solving groups in experimental social psychology and sociology, teams and work groups, family and household groups, children's play groups, adolescent gangs, adult cliques, social and recreational, and small associations of a great many kinds fall within the classification, as do groups of two, such as interviewer and interviewee, therapist and patient, teacher and pupil, and professional specialist and client, to name only a few." (page i)

It is important to remember that IPA is a method which is in itself dynamic. Its author emphasizes that the system has undergone a number of revisions and continues to do so. He writes in the preface that, "Insofar as the term 'interaction process analysis' is accepted by other workers, it should be taken to refer to a body of closely related but changing and developing methods." (page ii). These changes have proceeded in several phases, the first of which was theoretical, and involved the attempt to develop a structure which would be consistent with recognized research procedures. It was only later that Professor Bales and his associates became concerned with the effective use of these methods as practical instruments for understanding group interaction. As a result of his efforts to combine his practical and theoretical interests, a general category system was developed after a considerable amount of exploratory experience. At this point it is convenient to say that the term "category" should be taken as referring to a class of reaction into which observed behaviour may be coded; and a "category system" consists of two or more categories.

As stated before, the preliminary work was not at all easy. To achieve the objective of a set of categories which had general applicability

over groups, Bales searched the literature for existing category systems. Among the most outstanding are: Murray list of needs and presses; Allport and Odbert's dictionary of psychological states and trait names; van Viese's and Becker's "frame of reference for the systematics of action patterns"; French's categories for observers; categories for observers, constructed by Lippitt and later by Zim and Zander; various lists for use in analysing counselling protocols by Rogers, Porter, Snyder, Corner, Curran, Raimy, Roger, Lewis; Deutsche's list of functional rules of group members; Anderson's list for observation of teacher-pupil relations; Steinzor's list for analysis of verbal interaction in groups; observation and analysis procedures employed by Guetzkow and associaties at the University of Michigan, by Carr at the University of Michigan, by Thomas and associaties at Columbia University, by Hader and Linderman of the New York School of Social Work and some other observation systems. Bales also utilized free observation situations to note the kinds of categories which emerged spontaneously. He deliberately attempted to observe a wide variety of groups including teaching seminars and leadership training groups. All in all, about a dozen revisions of the original category system took place. At one time, there were as many as eighty seven categories, and at a later time as few as five.

At present the Bales system consists of twelve categories, and the claim that is made for it is that it provides an effective and practical instrument for the systematising of group interaction processes. As the Bales system is now being used by an increasing number of researchers, the present writer decided to accept this claim at its face value and to apply the system to the study of children working (on problem-solving tasks) in small groups of two. (As things turned out, the Bales system was not

altogether successful, so the experiment can be regarded not only as a small group study but also as a test of the applicability of Bales system to small groups of children).

Basically, the main object of the investigation was to compare the problem-solving behaviour of children working on their own, with the problem-solving behaviour of children working with different kinds of partner. Throughout this enquiry, emphasis is placed on the co-operative aspects of problem-solving situation. In other words, the main purpose is to consider the co-operative behaviour without taking into consideration the broad range of factors - personality, culture, social organization etc. - which are known to affect group processes as they relate to group solving. Here it seems appropriate to explain the sense in which this term - "group problem solving" is used. The present writer does not mean that the group "per se" solves a problem. Rather, this term is simply a shortcut way of stating that the members of the group have confronted and solved a certain task. Briefly, it refers to the psychological and social processes whereby individual solutions are created, communicated, and eventually assembled into a product that represents a group.

Perhaps the chief advantage of using Bales system is in combining the resources of several social fields which are utilized through the medium of the method and which is by Bales's description inter-disciplinary. He writes:

> "Nevertheless, within the last few years in various research centers there has been a series of spontaneous and independent developments leading toward a common focus on the process analysis of social interaction in small groups. There is no doubt in the writer's mind

that a new empirical field of investigation is crystallizing. This new field cuts across former disciplinary lines in the social sciences, particularly those of clinical psychology, social psychology, sociology and social anthropology. The study of the small groups in their many aspects is quite properly the concern of all these fields. It has substantial theoretical roots in each of them, and promises to be an important point of articulation between them." (page x)

A question which theorists might raise involves the validity and objectiveness of such a system. We may ask "Is this system sufficiently scientific for my study?" Professor Bales answered this question by saying:

"Insofar as beliefs include assumptions as to empirical nature of human interaction - that is, that certain types of action tend to have certain types of effects on subsequent action - the methods of science do become involved..... The method is not based upon any particular set of values or ideology other than those which are the norms of scientific procedure." (page ii)

Further details of Bales theory are given in Appendix A.

b. Subjects

The subjects of this investigation were 78 school children from infants to senior grades inclusive. The group contained 51 boys and 27 girls, of which 77 were white and 1 was coloured. These subjects ranged in age from six to fifteen years. The coefficient of intelligence ranged from 80+ to 120+. The children came from three different schools, which were representative of similar social and economic backgrounds. However, physically these schools differ in some respects. For example, the first school, hereafter designated as School A and attended by 22 of the

children (2,000 in total), is a Secondary-Comprehensive School - with rather formal discipline. It was built in 1957 in a very healthy area. Although the majority of the parents of these children were working class, quite a number of them were professionals, and almost all the children native born (English).

The second school, designated as School B and attended by 28 of the children (at present 574) is a junior mixed and infants - with a Roman Catholic religious influence in their school discipline. It was built in July 1886 in a very unhealthy, dirty and heavy traffic district area. The parents of these children were mostly unskilled labourers, many of whom (probably the majority) were foreign born.

The remaining school, designated as School C and attended by 28 of the children (at present 300) is a primary-nursery, infants and junior - with a highly socially trained discipline. It was built in 1880 in a seemingly poor and industrial district area. The parents of these children are mostly working class, unskilled labourers; English people with less than a dozen of mixture born.

Note: For further reference see Appendix B which gives general impressions of schools, locality and organisation of the children's background.

c. Apparatus

Three sets of puzzles and two construction tasks were employed. They were graduated in difficulty: easy, moderate and hard. The idea of the puzzles was taken from the Passalong Test. (The Passalong Test material consists of four trays with painted ends, one red and one blue, and thirteen blocks - eight 1" square, three 2" x 1", two 2" square, some painted red and some blue. There are eight diagrams depicting the end position in the nine

sub-tests, those for 2 and 3 being the same.) Other apparatus used: stop watch, tape recorder, pencil and paper.

The puzzles were classified into tasks:

	easy	moderate	hard
Set A	1,	2,	3
Set B	1,	2,	3 and a construction model - six wheeled engine.
Set C		2,	3 and a construction model - church

The following are the pictures representing each set of tasks:

Set A

1. squirrel

	Head
Tail	Body

This has three pieces plus an empty space. It is painted in two tones of brown. It is in a sitting position and between its forelegs it holds a nut. [See picture opposite].

2. parrot

Body	Head
Big Tail	Twig
End of Tail	

This consists of five pieces plus an empty space. It is painted in white, red, blue and yellow. It is perched on a twig, and is in a sitting position.

3. dog (hardest sub-test)

2 eyes	ear	White & Black	
tongue	body	End of body	White Black
White leg	2 feet	Big tail	Tail

This has eleven pieces and an empty space. It is painted in white and three tones of brown. It sits on its haunches.

Set B 1, 2, 3 and six wheeled engine

1. duck

Mouth	
Body	Tail

This has three pieces and empty space. It is painted green, white, blue, lilac and a touch of brown. It is in an erect position.

2. cow

Tail	Body	Head
Kettle	Legs	

This has five pieces and empty space. It is painted white, pink and two tones of brown. Stands on four legs.

3. rooster

	Head	Green corner	Green corner
Throat	Body	Tail	Green twig
Brown corner	Legs	Part of Tail	

This has ten pieces and empty space. It is painted yellow, green, 2 tones of brown, red and lilac with some touches of blue and grey.

Set C 2, 3 and church (Sub-task 1 is eliminated because of its ease)

2. donkey

Body	Head	Green ear
Tail	Mouth	

This has five pieces and empty space. It is painted in green and grey with some splashes of white and black. It rests on its hind legs.

3. horse

Tail	Sitting place muscles	Throat	Head
Left muscle	Body	Right muscle	Mouth
Back leg	Bent leg	Front legs	

This has eleven pieces and empty space. It is painted in two tones of brown, black, and blue with some spots in white. It is standing.

The back of each block is marked with a letter as shown in the diagrams below. This controls the disarrangement of each picture, so as to ensure that every child has exactly the same task to perform. (Of course, the children did not see the letters on the backs of the blocks).

Diagram of Blocks arranged to show picture

Diagram of Blocks disarranged as task

Set A

1. squirrel

	A
C	B

	C
B	A

2. parrot

A	B
C	D
E	

	E
D	C
B	A

3. dog

A	B	C	
D	E	F	G
H	I	J	K

open side of tray

I	J	K	
E	F	G	H
A	B	C	D

Set B

1. duck

A	
B	C

	C
A	B

PLATE 1. COMPLETED TRUCK

[SIX-WHEEL ENGINE]

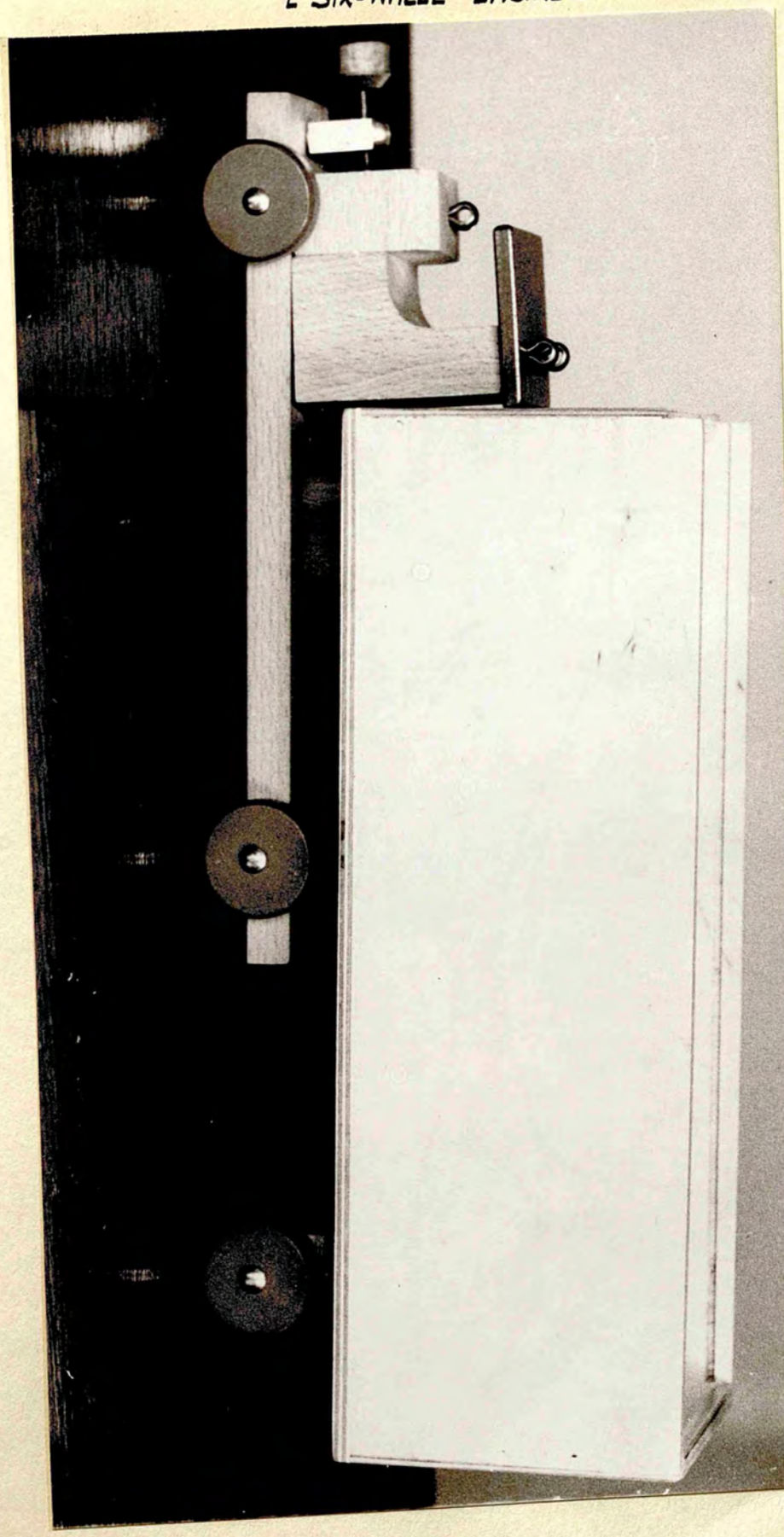
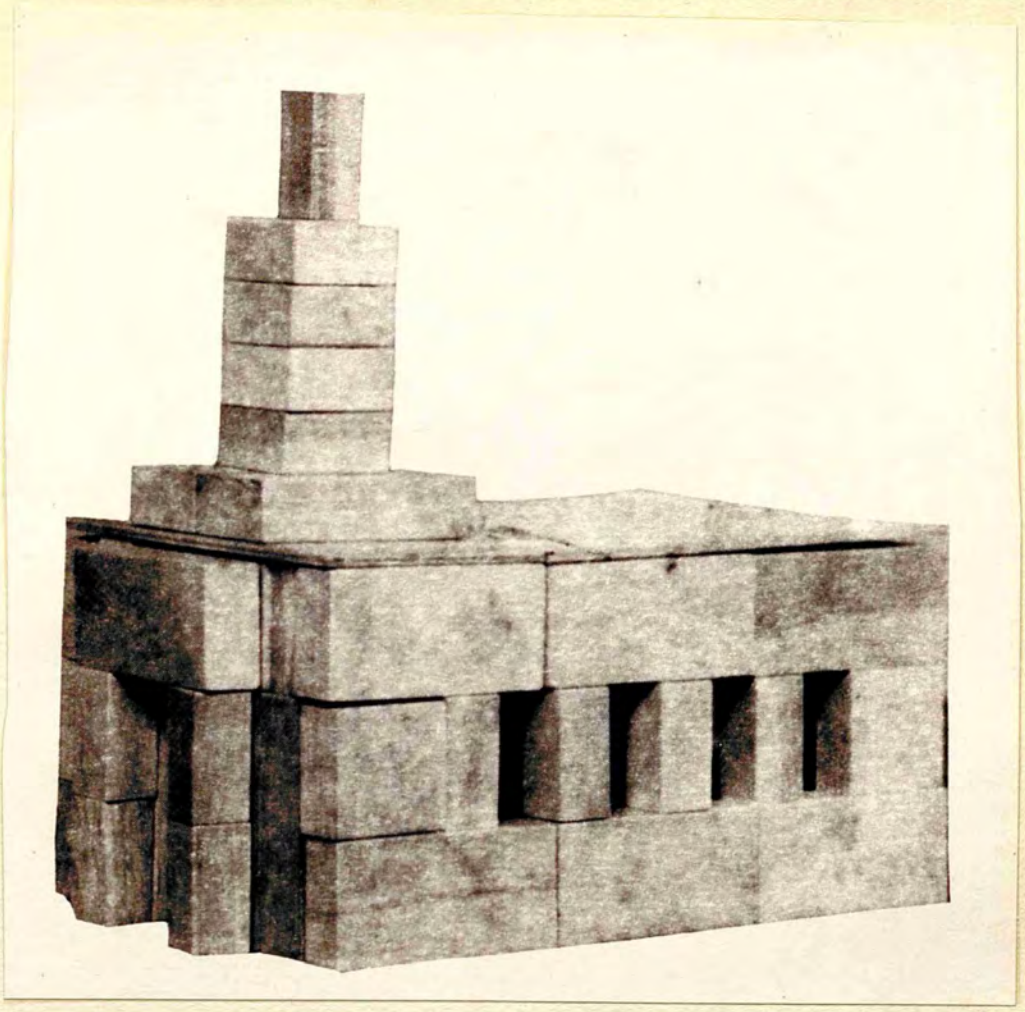
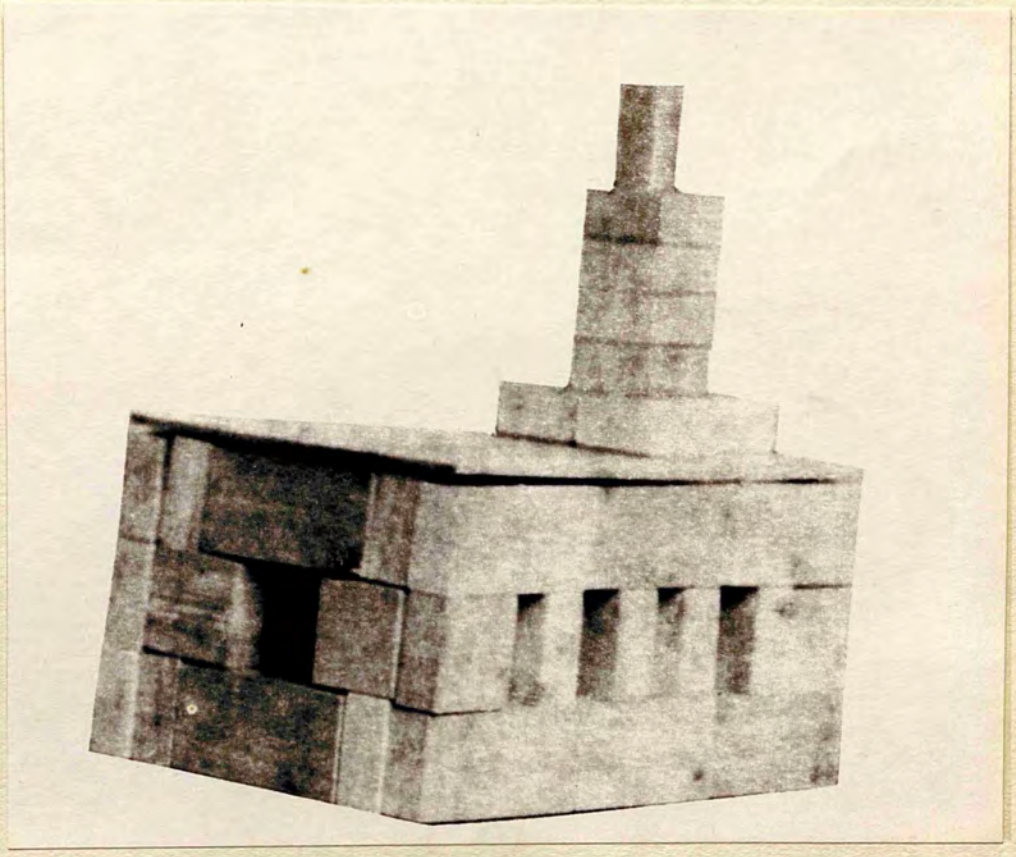


PLATE 2. THE COMPLETED CHURCH - BOTH VIEWS





2. cow

A	B	C
D	E	

	E	D
C	B	A

3. rooster

A		B	C
D	E	F	G
H	I	J	K

closed side of tray

I	J	K	
E	F	G	H
A	B	C	D

Pictures of these puzzles are given in Appendix C

Set C

2. donkey

A	B	C
D	E	

	E	D
C	B	A

3. horse

A	B	C	D
E	F	G	H
I	J	K	

open side of tray

I	J	K	
E	F	G	H
A	B	C	D

The two construction models are made of wooden blocks.

They are:

1. Six wheeled engine (plate 1)
2. Church (plate 2)

d. Procedure

As each child was called to see the experimenter, he or she had been told by the teacher, "You have been chosen to perform a task downstairs. I do hope you will do your best."

The child usually arrived at the testing room accompanied by another child of his own group and selected also for the experiment. They always knocked at the door and the experimenter greeted them very warmly and asked

them to come in. She started, "It is very nice to have both of you here, but to begin with, I have to work with one of you first; later we can work together. Now who is going to be first?" Usually they decided and one went out and sat on the chair placed at the right hand side of the closed door - in the hall. He was given a book so that he could read while waiting. As soon as the experimenter had finished with the first child, he - the child - advised the outside one to come in. Usually they assisted in fetching the other children and brought them down - this they did spontaneously.

This is how the conversation started once the child was ready for the task:

> "What is your name? Where do you come from? Have you ever heard of Puerto Rico? (Pause) Well Puerto Rico is a very small island in the Caribbean Sea, near the Bahamas. I presume you have heard of the Bahamas; they are among the British territories lately visited by the Duke of Edinburgh." (Attention should be drawn to the fact that the experimenter is very conscious that Prince Philip is very popular with English children. This, of course helps to arousetheir interest and to establish rapport between them and the experimenter). "You see in Puerto Rico we speak Spanish and so my English has a very strong Spanish accent. I expect you find my accent strange, so if you do not understand anything I say, please do not hesitate to interrupt me. I shall be very glad to repeat it as many times as necessary. Understand me? Good."

Tasks were always given in the same order:

> Set A - sub-tasks 1, 2, 3
>
> Set B - sub-tasks 1, 2, 3 and a construction model - six wheeled engine.

Set C - sub-tasks 2, 3 and a construction model - church.

Ten minutes was allowed for each sub-task, so that totals of thirty minutes for Set A, forty for Set B and thirty for Set C were allowed.

Set A. This was the only set of tasks that was administered individually to each of the 78 subjects. The following were selected from each school:

School A - 22 children. Average M.A. 13 years

No. of children	Chronological age	I.Q.	
6	11 years old	120+	superior
10	13 years old	100+	average
6	15 years old	80+	sub-normal

School B - 28 children. Average M.A. 8 years

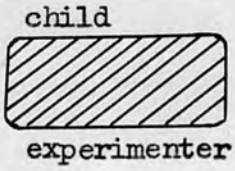
No. of children	Chronological age	I.Q.	
8	6 years old	120+	superior
12	8 years old	100+	average
8	10 years old	80+	sub-normal

School C - 28 children. Average M.A. 8 years

No. of children	Chronological age	I.Q.	
8	6 years old	120+	superior
12	8 years old	100+	average
8	10 years old	80+	sub-normal

Sub-Task No. 1

The picture of the squirrel was placed in front of the pupil. Next to it and nearer to him was placed the tray with the disarranged pieces. The sitting position of the pupil and the experimenter was like this:



This, of course, enabled the experimenter to observe the child's behaviour, for she could see the actions above the table and feel the children kicking under the table. This they did sometimes from restlessness and sometimes in an attempt to communicate with each other - usually to stop the activities of the other (Category 12).

The instructions given were:

"This is a squirrel (pointing to the picture). Now (pointing to the tray) this is the same squirrel but with the difference that this one (pointing again to it) is jumbled up. I want you to make this (pointing to the tray) look just like the picture. Notice that the blocks can be moved. (Here the experimenter demonstrated by moving one of them) but they must not be lifted out of the tray, like this (showing how). Now go ahead and make this (pointing to the tray) look just like the picture as quickly as you can. Ready? Go."

Note: It was suggested here that speed counted and the pupil was timed from the signal "Go". If at the end of ten minutes the pupil had not finished the experimenter stopped him, demonstrated how to do sub-task 1 and then allowed the pupil a second chance. As a general rule, this was not necessary because nearly all completed it successfully in a matter of seconds. Success or failure on it was recorded.

The essential purpose of sub-task 1 was to ensure that the pupil knew the nature of the task and that the experimenter had an opportunity to form an impression of the child.

Sub-Task No. 2

Again the diagram and the tray were placed in front of the pupil and he was told:

"Here is another puzzle like the last one, but this time you have a parrot instead of a squirrel. I want you to make this (pointing to the tray) look just like the picture. Remember that the blocks can be moved but they must not be lifted out of the tray. (Demonstrated by moving and lifting them). Now go ahead and make this (pointing to the tray) look just like the picture and quickly as you can. Ready? Go."

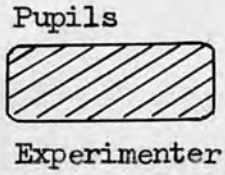
Note: As a rule it was found that instructions were unnecessary after the second sub-task had been done and that when the diagram and tray were placed before the pupil, he was immediately ready to tackle the job. Neither encouragement nor discouragement was expressed, but on successful completion of each sub-task, the experimenter thought it proper to say, "That is very good; now let us try the next one."

Sub-Task No. 3

Diagram and tray were placed in front of the pupil and he was told, "Here is another puzzle like the last two, but this time you have a dog instead of a squirrel and the parrot. Now go ahead and move the blocks in such a way that the tray will look just like the picture. Ready? Go."

Note: Instructions were reduced to a minimum. It was not necessary to repeat them any more. Child understood what to do next.

Set B. This task is done by pairs of children. The sitting positions of the pupils and the experimenter were like this:



Not all the children performed this task. Those who did it worked in twos,

paired so that each child was as nearly matched as possible in ability to his partner. Selection was based on the qualitative and quantitative results of Set A together with I.Qs. (Where these were known; and with the results of Raven's Progressive Matrices tests where I.Qs were not known).

The following groups were selected from each school:

School A

No. of pairs of children	Same chronological age
3 bright with bright	11 years with 11 years
5 average with average	13 years with 13 years
3 dull with dull	15 years with 15 years

School B

No. of pairs of children	Same chronological age
4 bright with bright	6 years with 6 years
6 average with average	8 years with 8 years
4 dull with dull	10 years with 10 years

School C

No. of pairs of children	Same chronological age
4 bright with bright	6 years with 6 years
6 average with average	8 years with 8 years
4 dull with dull	10 years with 10 years

"Now we shall see how well you work together. This is a joint task and I am sure you will enjoy doing it. You can talk to each other and feel free to do anything else you think will help finish the task. I shall be making notes but I don't want you to take any notice of me. Try to forget that I am here. Would you X? Would you Y?"

Sub-Task No. 1

The picture of the duck was placed in front of the pupils. Next to it and nearer them was placed the tray with the disarranged duck.

The instructions given were:

"This is a duck (pointing to the picture). Now (pointing to the tray) this is the same duck but with the difference that this one (pointing again to it) is jumbled up. I want both of you to make this (pointing to the tray) look just like the picture. Notice that the blocks can be moved (experimenter demonstrated by moving one of them) but they must not be lifted out of the tray, like this (showing how). Now go ahead, both of you together, and make this (pointing to the tray) look just like the picture as quickly as you can. Ready? Go."

Note: It is important to point out that while experimenter was giving instructions pupils nodded as if knowing exactly what to do next. Instructions were not required - this may be due to their experience of working alone at a similar task. Children knew each other.

Sub-Task No. 2

The picture of the cow was placed in front of the pupils. Next to it and nearer to them was placed the tray with the disarranged cow.

The instructions given were as follows:

"This is a cow. I want both of you to make it look just like the picture. Now go ahead, both of you together, and make this tray the same as the picture as quickly as you can. Ready? Go."

Sub-Task No. 3

The picture of the rooster was placed in front of the pupils. Next to it and nearer to them was placed the tray with the disarranged rooster.

The instructions given were:

"This is a rooster. I want both of you to make it just like the picture. Now go ahead, you two together, and make this tray the same as the picture as quickly as you can. Ready? Go."

Six-wheeled engine

Experimenter started with encouraging remarks, "You two have done very well with the puzzles. Let us do something else.

We are going to construct a model, like this (presenting a picture with the six wheeled engine at the centre of the table - in front of the two pupils). You see, I want both of you, together, to build this (pointing to the picture) as quickly as you can. Remember this is a joint task and I want both of you to do it together. Here are the pieces from which the model is to be made."

(Experimenter placed all the pieces on the table and asked the pupils to mind their ears because of the noise made in placing them on the table). "Notice", she continued, "that you do not need all these pieces to make the model. You two are going to select only the pieces which are necessary to build the model. Now do you both understand what you have to do? Remember I want both of you to construct this model (pointing to the picture) as quickly as you can. Ready? Go."

Note: Notice that at no time was the word "engine" mentioned by the experimenter, although the pupils usually guessed and exclaimed "It's an engine".

This of course, the experimenter thought, would arouse more interest in the model.

Set C. Again the pupils performed this task in pairs, the pairing off made according to the length of time taken in performing task A and the results obtained from the Progressive Matrices. Two groups were selected, this time of different chronological age and similar mental age.

The following groups were chosen from each school:

School A

No. of pairs of children	Different chronological age	I.Q.
5 bright with average	11 with 13 years	120+/100+
5 average with dull	13 with 15 years	100+/80+

School B

No. of pairs of children	Different chronological age	I.Q.
6 bright with average	6 years with 8 years	120+/100+
6 average with dull	8 years with 10 years	100+/80+

School C

No. of pairs of children	Different chronological age	I.Q.
6 bright with average	6 years with 8 years	120+/100+
6 average with dull	8 years with 10 years	100+/80+

The instructions given were as follows:

"Again we shall see how well you work together. As you have seen before, you may talk to each other and feel free to do anything else you think will help finish the task."

Note: that set C did not have sub-task No. 1. Experimenter thought it best to omit it, since it was an extremely simple task and sets A and B had made the children familiar with the performance required of them. Moreover, the "easy" tasks of set A and B proved so simple that the children accomplished them in a matter of seconds and with a minimum of interaction.

For this set of tasks the pupils had to be introduced to each other because they did not know each other before - they belong to different forms.

Sub-Task No.2

The picture of the donkey was placed in front of the pupils. Next to it and nearer them was placed the tray with the disarranged donkey. The instructions given were:

"This is a donkey. I want both of you to make it like the one in the picture. Now go ahead you two, together, and make this tray the same as the picture, as quickly as you can. Ready? Go."

Sub-Task No. 3

The picture of the horse was placed in front of the pupils. Next to it and nearer them was placed the tray with the disarranged horse. The instructions given were:

"This is a horse. I want both of you to make it like the one in the picture. Now go ahead, you two, together, and make this tray the same as the picture as quickly as you can. Ready? Go."

Construction of the Church

The examiner started by suggesting that the children make another model. She added, "Last time we built a six wheeled engine (this was the only occasion on which the name of the model was mentioned). Today we are going to build this one"(presenting the picture showing the entrance to the church). The instructions given were as follows:

"Look very carefully at these two pictures. They are of a church. This is the front entrance of the church (Experimenter shows painting of front of church). And here I have another picture of the same church. I brought this so that you could see the back of the church. (Experimenter

presented picture of back view of church). (Mention of the model was made because experimenter thought it necessary to make clear that only one church was to be built).

"Now, as quickly as you can, I want both of you to work together and build a church like the one in the pictures. Ready?" (Experimenter stood up and placed all the blocks on the table and asked pupils to mind their ears for the noise made in placing the blocks on top of the table). "Notice", she commented, "all these blocks are needed to make the church. As you can see the blocks are of the same colour but of different shapes - big, smaller, square, rectangular, etc. Do you understand what to do I want both of you to build a church, together and as quickly as you can. Ready? Go."

Procedure - Summing up

The following groups were selected from each school:

School A: 26 children in total

A.	No. of children	chronological age	I.Q.
	6 bright	11 years	120+
	10 average	13 years	100+
	6 dull	15 years	80+

B.	No. of pairs of children	chronological age same
	3 bright with bright	11 years with 11 years
	5 average with average	13 years with 13 years
	3 dull with dull	15 years with 15 years

C.	No. of pairs of children	chronological age different
	5 bright with average	13 years with 11 years
	5 average with dull	13 years with 15 years

School B: 28 children

A.	No. of children	chronological age	I.Q.
	8 bright	6 years	120+
	12 average	8 years	100+
	8 dull	10 years	80+

B.	No. of pairs of children	chronological age same
	4 bright with bright	6 years with 6 years
	6 average with average	8 years with 8 years
	4 dull with dull	10 years with 10 years

C.	No. of pairs of children	chronological age different
	6 bright with average	6 years with 8 years
	6 average with dull	8 years years with 10 years

School C: 28 children

A.	No. of children	chronological age	I.Q.
	8 bright	6 years	120+
	12 average	8 years	100+
	8 dull	10 years	80+

B.	No. of pairs of children	chronological age same
	4 bright with bright	6 years with 6 years
	6 average with average	8 years with 8 years
	4 dull with dull	10 years with 10 years

C.	No. of pairs of children	chronological age different
	6 bright with average	6 years with 8 years
	6 average with dull	8 years with 10 years

IV DISCUSSION OF RESULTS

As indicated in the title of the thesis the object of the investigation was to study co-operative behaviour in young children working in groups. However, it is well known that in an investigation of this kind unpredicted snags often arise, and in this particular investigation a number of potentially interesting results appear to have been partially obscured by the fact that Bales' categories did not work as efficiently as expected when applied to young children.

But this in itself is an important finding because the Bales categories are probably the most popular categories for classifying interaction processes. As a matter of fact, they are almost the only categories available. As Karlsson (12) points out: "Among the items that have to be covered by a good interaction scheme are: the extent to which acts are mere emotional outlets, and the kind of emotion they stand for, attempts to gain power and status, attacks on, or help to other members, norm speaking, and leadership behaviour". As the Bales system is able to throw light on all these points it is hardly surprising that it has been widely adopted. It is therefore all the more important to assess its validity and scope.

In this connection, it should be noted that Bales did not arrive at his categories by means of empirical research, but proposed them as an a priori set of mutually exclusive categories. Admittedly some attempts have been made to validate Bales' system and the general textbook conclusion is that his twelve-categories method is adequate for most purposes as long

as one does not claim too much precision for the data obtained. But it is worth remarking that attempts to validate the Bales system have chiefly been carried out by Bales himself, or by his associates, and this is hardly a desirable state of affairs. In view of the increasingly wide acceptance of Bales' system, it may be one of the most important findings in the present study that the scheme is by no means as efficient as some writers have supposed.

It might, of course, be argued that the present writer did not apply the categories properly. But this kind of objection would, in fact, amount to an admission that the Bales categories are not truly objective. After all, one of the chief claims made for the method is that any intelligent researcher should be capable of applying it.

After allowing for difficulties involved in the application of Bales' categories to children, it turns out that the main effect of pairing children with different kinds of partners occurs in the so-called "negative emotional areas". This again is an important finding because it might have been expected that the "positive emotional areas" and the "task areas" would also be considerably affected. Of course, there are certain reservations to be made. In the first place, it must be remembered that children are working only in groups of two. In consequence they could not be expected to exhibit the kinds of behaviour characteristic of larger groups, in which various coalitions and dominance hierarchies can usually be seen to emerge. It must also be remembered that these children were performing in front of a comparative stranger and might well have been on their best behaviour, despite the permissive nature of the experimental situation. If various inhibiting forces were at work, it is

perhaps all the more significant that the negative emotional areas should have been so much affected.

The two major conclusions then concern the weaknesses of the Bales categories when applied to children and changes of behaviour in the negative emotional areas. It would be misleading to pretend that the collected data establish any further finding with certainty. But a large number of rather suggestive trends emerged and these will be discussed at a later stage. For instance, there is evidence that children are emotionally more disturbed by being paired with an <u>older</u> partner than by being paired with a <u>younger</u> partner. However, there are big individual differences here.

In the following sections of the discussion these main conclusions and the additional suggestions will be discussed and elaborated from various points of view. As a starting point, it will be convenient to consider the main statistical analysis.

Time Effects

One way of assessing the effect of working with a partner, as opposed to working alone, is to consider the differences in time taken to solve problems under the various working conditions. However, there are difficulties involved in comparing times, because it was necessary (for administrative purposes) to design the experiment so that a child always worked <u>firstly</u> on his own, <u>secondly</u> with a child of the same age, and <u>thirdly</u> with a child of a different age. This order was never varied. Furthermore, slightly different tasks were used on the three different occasions, and these were not necessarily equated in difficulty for all children. It follows that any significant time differences might be due,

TABLE 1

Effect on the time scores for B puzzles of working with another child (the same age, older or younger) compared with individual completion times

	No. who gain in pairs of either kind	No. who lose in pairs of either kind	No. who gain with own age child & lose with different age	No. who lose with own age & gain with different age	No. who gain with own age & show no difference with other age	No. who lose with own age & show no difference with other age
School A 11 yrs	3	0	0	1	-	-
13 yrs	1	2	4	1	-	-
15 yrs	1	3	0	0	-	-
Total	5	5	4	2	0	0
School B 6 yrs	1	4	0	0	0	1
8 yrs	0	8	4	0	0	0
10 yrs	2	0	2	1	1	0
Total	3	12	6	1	1	1
School C 6 yrs	3	0	2	0	1	-
8 yrs	6	0	3	3	0	-
10 yrs	3	0	2	0	1	-
Total	12	0	7	3	2	0
Overall Total	19	17	17	6	3	1

Note: See Appendix E for details of the individual time scores.

not only to the three different working conditions (alone, same age, different age) but also to practice, fatigue, differential difficulty of tasks or other effects. In addition, there are all the other uncontrolled factors (personality etc.) already mentioned.

In view of these difficulties, only very tentative conclusions can be drawn. The collected data have been summarised in table 1 (detailed score - Appendix E).

The table shows the effect on time scores for each child under tasks A_2, B_2 and C_2, and it is possible to categorise children according to whether they gain in time throughout, or lose throughout, or gain and lose etc. This enables one to see roughly what the effect of the different situations was on the efficiency of each child.

In the case of School B, for instance, it can be seen that there is a tendency for older children to gain (in time) and for younger children to lose, as the experiment progresses. Naturally, it is not clear whether this is due to the working conditions being altered or to some other factor. (For instance, younger children may get fatigued more quickly).

In the case of School C, very few time losses occur and no children lose throughout. If the data are reliable this suggests that School C benefits more than School B from working in co-operation.

In the case of School A, the School B tendency is reversed. In other words, the trend is for the older (15 years old) children to lose from being paired with a partner, and for the younger (13 years old) children to gain. This finding cannot be interpreted with any degree of certainty, since the individual differences are too great for any of the differences in scores to be statistically significant. But the results are of some

interest in view of the similarity of the children's initial time scores in the different schools.

Social Effects

Perhaps the most common difficulty encountered by any researcher into social behaviour is the difficulty of dealing with "unwanted variables". In statistical textbooks there seems to be a rule that effects and biases due to unwanted variables should either be eliminated (e.g., by using carefully balanced samples) or properly measured.

In the present study, for example, there could easily be special complications due to sex, personality, training, socio-economic status, practice or fatigue effects etc. In order to check on all these factors a highly elaborate experiment would have been necessary - involving much larger samples, much more data (e.g., on personality and individual differences), and various cross-checking procedures to see, for instance, whether a child's performance remains fairly constant or varies from day to day. These extensions of the work would have demanded more time and greater facilities than were available.

Since the "ideal" experiment could not be done, and the control procedures could not be complete, any conclusions that are drawn (apart from the two already mentioned) are bound to be suggestive only; in an exploratory experiment in social psychology it has to be accepted that the findings may be open to re-interpretation.

In the statistical analysis, the method adopted was to secure average frequencies under various Bales' categories and to subject these to the analysis of variance technique. Such analyses were conducted for each category, for each school, and for certain combinations of ages. These

analyses are described in summary form in Appendix D. The F-ratios derived from these analyses are then summarised in Tables 2, 3 and 4, and it will be convenient to discuss each table separately.

However, there are two further remarks that need to be made:

(a) In analyses of the present kind, where a large number of F-ratios are computed, some of these might be significant by "chance", because an F-ratio that reaches the 5% level of significance is one that can be expected to occur by chance about once in twenty times (1 in 20 = 5%). So if 20 such ratios are computed it would, in fact, be rather surprising if one of them did not reach the 5% level. This being so, it would be wrong to attach too much importance to the occasional appearance of significant F-ratios.

(b) Finally, it is worth recalling that all statistical procedures involve certain assumptions about the nature of the samples being examined, and about the "populations" from which they are drawn. In the present study there are often quite large individual differences between children in the scores under particular categories, and for this reason the samples are irregular in size, a fact which reduces to some extent the amount of confidence that can be placed in the analysis of variance findings.

In view of the above considerations, no attempt will be made to extract dogmatic conclusions from the data collected. Instead, the discussion will be based in part on the quantitative data, and in part on the writer's actual experiences with the children in question. Perhaps it need hardly be said that no quantitative table of frequencies could ever impart the full richness of these experiences.

TABLE 2

Behaviour difference between ages shown in terms of Bales Categories of Interaction

A. Linear Effects : Values of F^1

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	8.43**	. . . .	4.82*
2	. . . .	. . . .	. . . .
3	1.40	. . . .	. . . .
4	. . . .	. . . .	. . . .
5	_____	_____	_____
6	1.24	. . . .	6.40*
7	1.73	. . . .	. . . .
8	_____	_____	_____
9	_____	_____	_____
10	. . . .	. . . .	. . . .
11	5.00*	4.45*	. . . .
12	7.73*	1.21	. . . .
C (Concentration)	9.23**	. . . .	. . . .

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus _____

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 2 (Continued)

B. Curvature Effects : Values of F[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	3.96	. . . .	13.67**
2	. . . .	3.82	. . . .
3	2.41	. . . .	4.37*
4	. . . .	1.88	2.85
5	———	———	———
6	. . . .	3.49	. . . .
7	. . . .	. . . .	. . . .
8	———	———	———
9	———	———	———
10	. . . .	2.44	. . . .
11	2.01	. . . .	3.81
12	1.87	2.56	2.40
C (Concentration)	. . . .	2.29	. . . .

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus _____

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 2 (Continued)

B. Difference between ages : Values of F[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	6.20**	. . . .	6.08**
2	. . . .	1.91	. . . .
3	1.91	. . . .	2.28
4	. . . .	1.24	1.60
5	———	———	———
6	. . . .	1.84	3.30*
7	1.20	. . . .	. . . .
8	———	———	———
9	———	———	———
10	. . . .	1.25	. . . .
11	3.51*	2.31	1.90
12	4.80*	1.89	1.28
c (Concentration)	4.73*	1.33	. . . .

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus ———

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

Note 2 (Table 2)

The twelve major categories (Bales) in terms of which the scoring is done are shown here:

Social Emotional Area: Positive	A	1. Shows solidarity, raises other's status, gives help, reward:
		2. Shows tension release, jokes, laughs shows satisfaction:
		3. Agrees, shows passive acceptance, understands, concurs, complies:
Task Area:	B	4. Gives suggestion, direction, implying autonomy for other:
		5. Gives opinion, evaluation, analysis, expresses feeling, wish:
		6. Gives orientation, information, repeats, clarifies, confirms:
Neutral	C	7. Asks for orientation, information, repetition, confirmation:
		8. Asks for opinion, evaluation, analysis, expression of feeling:
		9. Asks for suggestion, direction, possible ways of action:
Social Emotional Area: Negative	D	10. Disagrees, shows passive rejection, formality, withdraws help:
		11. Shows tension, asks for help, withdraws out of field.
		12. Shows antagonism, deflates other's status, defends or asserts self:

The major categories in terms of which the scoring is done are shown here:

Social Emotional Area: Positive A	1.	Shows solidarity, raises other's status, gives help, reward:
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Task Area: B	4.	Gives suggestion, direction, implying autonomy for other:
	5.	Gives opinion, evaluation, analysis, expresses feeling, wish:
	6.	Gives orientation, information, repeats, clarifies, confirms:
Neutral C	7.	Asks for orientation, information, repetition, confirmation:
	8.	Asks for opinion, evaluation, analysis, expression of feeling:
	9.	Asks for suggestion, direction, possible ways of action:
Social Emotional Area: Negative D	10.	Disagrees, shows passive rejection, formality, withdraws help:
	11.	Shows tension, asks for help, withdraws out of field.
	12.	Shows antagonism, deflates other's status, defends or asserts self:
	C	Concentration

Table 2

This table is concerned with children who worked with a partner of their own age group. In other words, it comprises the age groups: 6 with 6; 8 with 8; 10 with 10; 11 with 11; 13 with 13; and 15 with 15. In particular the F ratios are concerned to measure

(i) linear effects,

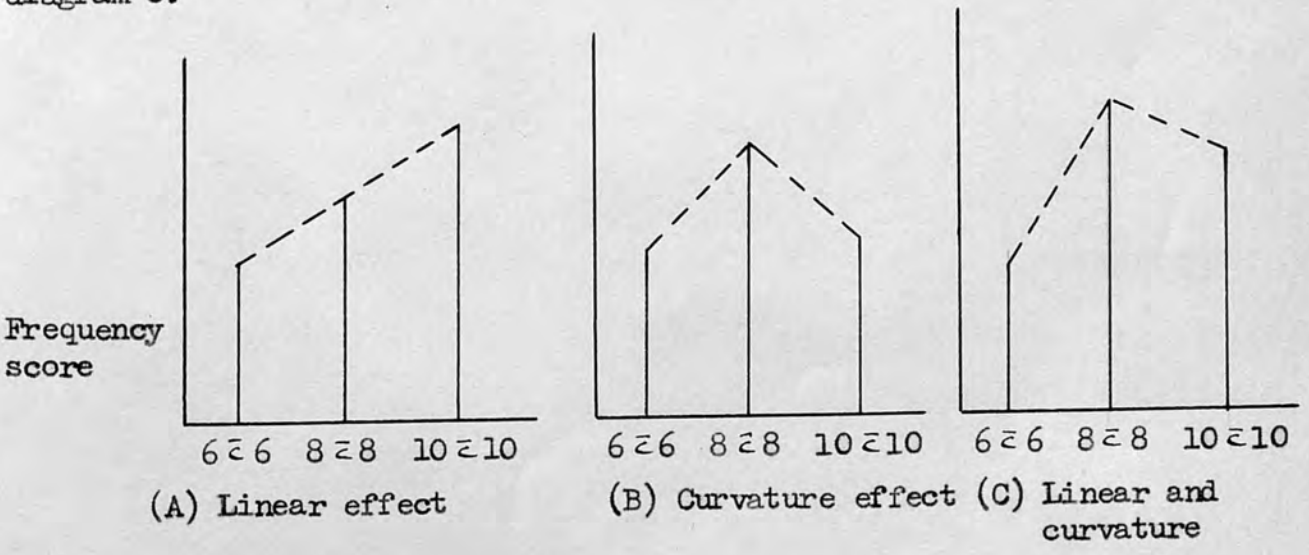
(ii) curvature

(iii) differences between ages.

A linear effect will arise if for any one school there is a general increase or decrease in average frequencies as age increases. An example of a linear increase is indicated in diagram A below.

Alternatively, it is possible to have a curvature effect if an increase is followed by a comparable decrease (or vice versa). An example of such an effect is given in Diagram B.

Finally, the data could exhibit both a linear and a curvature effect if, for instance, an increase were to be followed by a decrease as in diagram C.



(A) Linear effect (B) Curvature effect (C) Linear and curvature

If the different age groups show overall differences in frequency scores, this would constitute a difference between ages.

And if children belonging to the same age group are found to have different scores, this would constitute a difference within ages.

The object of Table 2 is not so much to compare the F ratios with each other, as to draw attention to high F values in specific cases. All that is needed, therefore, is a brief commentary on the most significant figures.

With the exception of School B, category 1 has the greatest number of significant F values. In general terms this implies that signs of solidarity etc. tend to be most affected by age. Thus, in the case of School C, it can be seen that a significant linear effect exists with respect to three age groups, but a much more highly significant curvature effect also exists: there is a sharp drop in mean frequency from 14.6 (for the 6 with 6 pairings) to 7.08 (for the 8 with 8 pairings), and this is followed by a slight increase to 9.9 (for the 10 with 10 pairings). Apparently, the 6 year olds, who are the brightest (for their age), show the greatest solidarity - and this is reasonable enough. But it is not clear why the 10 with 10 group should show more solidarity than the 8 with 8 group. Presumably, it might be suggested that the 10 with 10 group are united by their (comparative) backwardness. Alternatively, certain uncontrolled variables - such as individual differences - might be responsible. Apparently, there is a choice of post hoc explanations, and the data cannot indicate which explanation is the right one.

The next category with the greatest number of significant F values is 11, which refers to tendencies to show tensions, ask for help, withdraw, etc. The F ratios do not indicate the direction of these effects and an inspection of the mean frequencies gives little help psychologically. Furthermore, an examination of the raw data shows, in some cases, an

TABLE 3

A comparison of behaviour of children working with a child of the same age and the behaviour of the same child working with one who is younger and more intelligent.

A. Differences between ages : F. values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	4.87	. . . .	. . . .
2	. . . .	. . . .	. . . .
3	. . . .	2.31	. . . .
4	. . . .	3.60	1.50
5	_____	_____	_____
6	6.89**	7.45**	1.46
7	. . . .	. . . .	3.12
8	_____	_____	_____
9	_____	_____	_____
10	. . . .	1.11	. . . .
11	1.83	. . . .	6.18**
12	1.46	. . . .	5.15**
C (Concentration)	4.14	. . . .	. . . .

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus _____

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 3 (Continued)

B. Effect from the age of the partnet : F values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	. . . .	. . . .	2.49
2	1.12	. . . .	. . . .
3	. . . .	. . . .	2.40
4	. . . .	1.71	2.02
5	———	———	———
6	4.17	1.77	1.17
7	. . . .	. . . .	1.74
8	———	———	———
9	———	———	———
10	. . . .	2.72	. . . .
11	. . . .	. . . .	. . . .
12	. . . .	. . . .	2.86
C (Concentration)	5.39	3.42	. . . .

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus ———

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 3 (Continued)

C. Interaction between age and age of partner : F values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	. . . .	. . . .	. . . .
2	. . . .	. . . .	2.88
3	1.01	1.94	2.35
4	. . . .	. . . .	. . . .
5	———	———	———
6	. . . .	1.12	4.45
7	. . . .	. . . .	. . . .
8	———	———	———
9	———	———	———
10	. . . .	. . . .	. . . .
11	9.36*	. . . .	. . . .
12	. . . .	1.03	. . . .
C (Concentration)	2.86	22.16**	1.32

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus ———

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 3 (Continued)

D. Differences between children within an age group : F values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	. . . .	2.61	1.06
2	. . . .	1.53	2.85
3	1.40	4.82**	1.02
4	1.02	. . . .	1.58
5	———	———	———
6	2.67	1.28	4.25*
7	1.19	2.30	1.21
8	———	———	———
9	———	———	———
10	. . . .	4.51**	. . . .
11	3.29	1.32	1.57
12	. . . .	1.43	. . . .
C (Concentration)	. . . .	3.56*	2.00

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus ———

F values with PL.05 are indicated thus *

F values with PL. 01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

increase with age and in other cases a decrease. No general tendency, therefore, is apparent here.

It will be seen that category 6, which is concerned with giving orientation, information, etc., and category 12 which is concerned with antagonism, etc., also showed rather firm tendencies to change with age, and again the reasons are not clear. The remainder of Bales' categories exhibit negligible changes with age.

Table 3

The object of this table is to record F ratios computed from scores provided by children working with a partner of their own age or alternatively, a younger child. Hence, the age groups involved are the 6 with 6; 8 with 8; 10 with 10; 11 with 11; 13 with 13; 15 with 15; 8 with 6; 10 with 8; 13 with 11; 15 with 13.

Once again summary analyses of variance are appended and it will be seen that somewhat different measures have been calculated. In this particular table linear and curvature effects are less relevant and have been replaced by F ratios which measure, for each school separately:

(a) significant differences in category scores between the three age groups.

(b) significant differences resulting from the two different kinds of pairing (with child of same age or with younger child).

(c) significant differences between children belonging to the same age group.

(d) interaction effects.

As before it will be possible only to comment on individual values of F as the purpose of the table is not to compare individual F ratios

with others but to show specific effects.

It can be seen that category 6 has the largest number of significant F values. This category is concerned with giving orientation, information, etc. and appears to be a category that merits further investigation, since it is clear that this factor varies between ages, between types of partner and within individual age groups. It is not obvious from the raw data why this category should be so variable. Presumably, it may be sensitive to environmental and personality differences as well as to age differences. The experiment was not explicitly designed to throw light on this point. Further research is necessary.

Of the remaining categories, only category 11 and category C contain more than one significant F ratio. In the case of the C category, the interaction factor for School B reaches the highest significant value of 22.16 and suggests that age, school and partner differences all affect each other in complex ways. Strictly speaking, this is all that the interaction F ratios reveal, but it is possible to speculate that with the younger children, concentration increases when they are paired with a younger partner, but in the case of older children it makes much less differences whether or not a younger child is introduced as a partner. The suggestion here is that a younger child may feel he is expected to take the initiative if his partner is even younger, whereas an older child may regard a junior partner as a handicap.

Once again, it is useful to bear in mind that other categories do not show many significant changes. In any future research which attempts to apply the Bales categories to children these findings may be of value since they suggest that for children certain categories are likely to be much more useful than others.

TABLE 4

A comparison of the behaviour of children working with a child of the same age and the behaviour of the same child working with one who is older and less intelligent.

A. Differences between ages : F values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	. . . .	1.21	2.35
2	. . . .	3.21	3.42
3	1.38	. . . .	. . . .
4	. . . .	. . . .	. . . .
5	_____	_____	_____
6	2.65	3.92	4.78*
7	. . . .	. . . .	. . . .
8	_____	_____	_____
9	_____	_____	_____
10	6.02*	2.77	4.29
11	. . . .	14.36**	4.04
12	6.99*	6.16*	2.28
C (Concentration)	4.39	. . . .	. . . .

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus _____

F values with PL.05 are indicated thus *

F values with PL. 01 are indicated thus **

Note 2 See following notes for definition of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 4 (Continued)

B. Effect from the age of the partner : F values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	1.24	3.04	. . . .
2	. . . .	. . . .	. . . .
3	. . . .	1.82	. . . .
4	. . . .	1.14	. . . .
5	———	———	———
6	. . . .	. . . .	3.67
7	3.95	. . . .	. . . .
8	———	———	———
9	———	———	———
10	1.58	3.33	3.19
11	. . . .	. . . .	. . . .
12	. . . .	1.16	7.66*
C (Concentration)	1.95	. . . .	4.93*

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus ———

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definitions of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 4 (Continued)

C. Interaction between age and age of partner : F values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	1.24	2.45	2.69
2	. . . .	. . . .	. . . .
3	. . . .	1.29	. . . .
4	1.23	. . . .	. . . .
5	_____	_____	_____
6	. . . .	. . . .	1.66
7	. . . .	. . . .	2.32
8	_____	_____	_____
9	_____	_____	_____
10	10.84**	. . . .	. . . .
11	. . . .	. . . .	. . . .
12	. . . .	. . . .	. . . .
C (Concentration)	10.85**	1.03	. . . .

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus _____

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definitions of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

TABLE 4 (Continued)

D. Differences between children within an age group: F values[1]

Bales Cat.[2]	School A[3]	School B[3]	School C[3]
1	. . . .	. . . .	. . . .
2	3.70	. . . .	. . . .
3	2.13	. . . .	2.07
4	1.95	1.16	1.27
5	———	———	———
6	1.72	1.30	2.12
7	1.10	. . . .	1.74
8	———	———	———
9	———	———	———
10	4.11*	. . . .	3.35*
11	1.80	3.57*	1.94
12	5.58*	1.35	. . . .
C (Concentration)	4.55*	1.84	1.36

Note 1 F values below one are not given and are indicated thus . . . .

Values not tested because of low frequency are indicated thus ———

F values with PL.05 are indicated thus *

F values with PL.01 are indicated thus **

Note 2 See following notes for definitions of categories

Note 3 Data from each school is analyzed separately : See Appendix D for details.

Table 4

The F-ratios recorded in this table are laid out in the same manner as in Table 3, but they deal with children who are paired with partners of their own age, or partners who are older. Thus, the age groups 6 with 6; 8 with 8; 10 with 10; 11 with 11; 13 with 13; 15 with 15; 6 with 8; 8 with 10; 11 with 13; 13 with 15 are represented.

Perhaps the most striking feature of Table 4 is the fact that almost all the significant F ratios fall in categories 10, 11, 12 and C. This suggests strongly that some kind of emotional upset may be caused by pairing off a child with an older partner. It will be remembered, of course, that categories 10, 11 and 12 refer to Bales' social emotional negative reactions. The fact that there are some significant F ratios in category C might reasonably be ascribed to the fact that emotional upset may require children to concentrate harder on the task in hand. It may be recalled that the negative emotional area is involved to a lesser extent in Table 3. We can therefore conclude that it is less emotionally disturbing to be paired with a younger child than with an older child.

Since the individual F ratios are not in themselves as informative as they might be, any detailed commentary could at this stage only be speculative. It will therefore be convenient to summarize the more conclusive findings that have just been described.

Summary

The main virtue of the analyses in Tables 2, 3 and 4 is that they indicate the categories which appear to be most affected by the experimental situation. In Table 2, which deals with children paired with partners of the same age, category 1 appears to be important. This suggests that patterns of solidarity might show systematic change

FIGURE 1.

AVERAGE VALUES OF I.P.A. CATEGORIES FOR EACH AGE GROUPS (WHEN WORKING WITH A PARTNER OF THE SAME AGE) IN EACH SCHOOL.

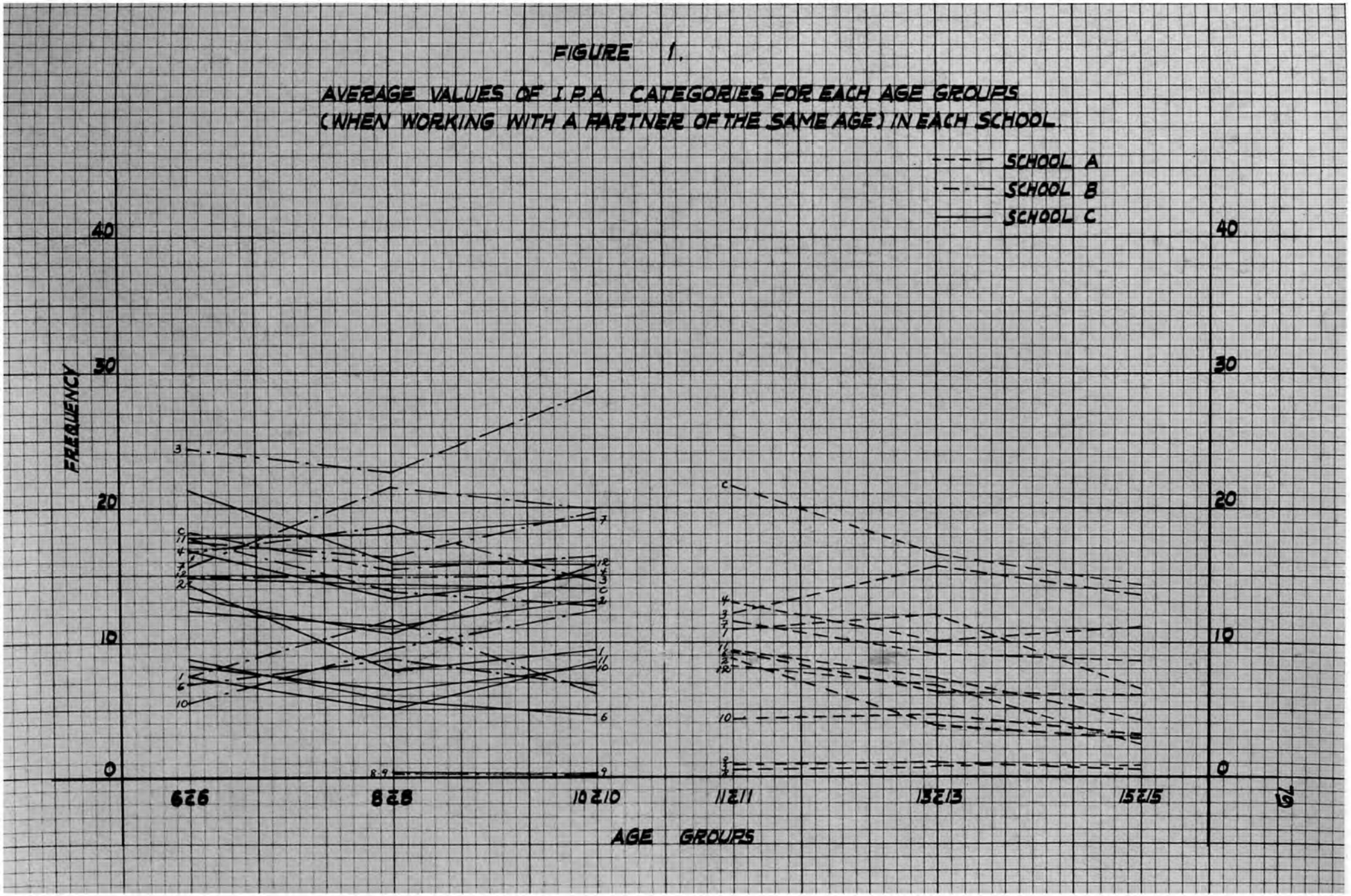


FIGURE 2.

SCHOOL A : AVERAGE FREQUENCY OF I.P.A. SCORE FOR ALL CATEGORIES, SHOWING CHANGES IN FREQUENCY RESULTING FROM DIFFERENT TYPES OF PAIRING.

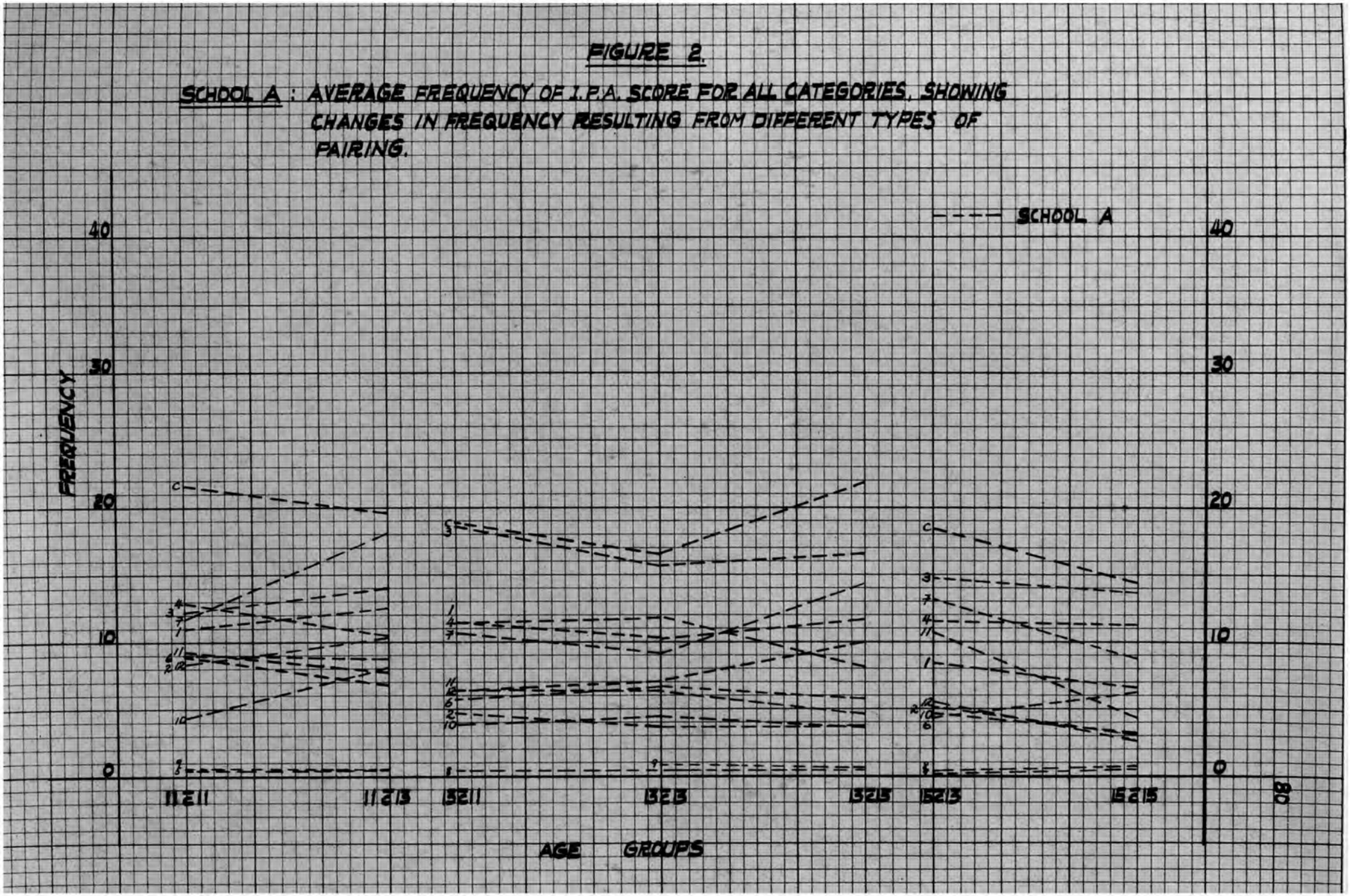


FIGURE 3.

SCHOOLS B & C : AVERAGE FREQUENCY OF I.P.A. SCORES FOR ALL CATEGORIES SHOWING CHANGE IN FREQUENCY RESULTING FROM DIFFERENT TYPES OF PAIRING.

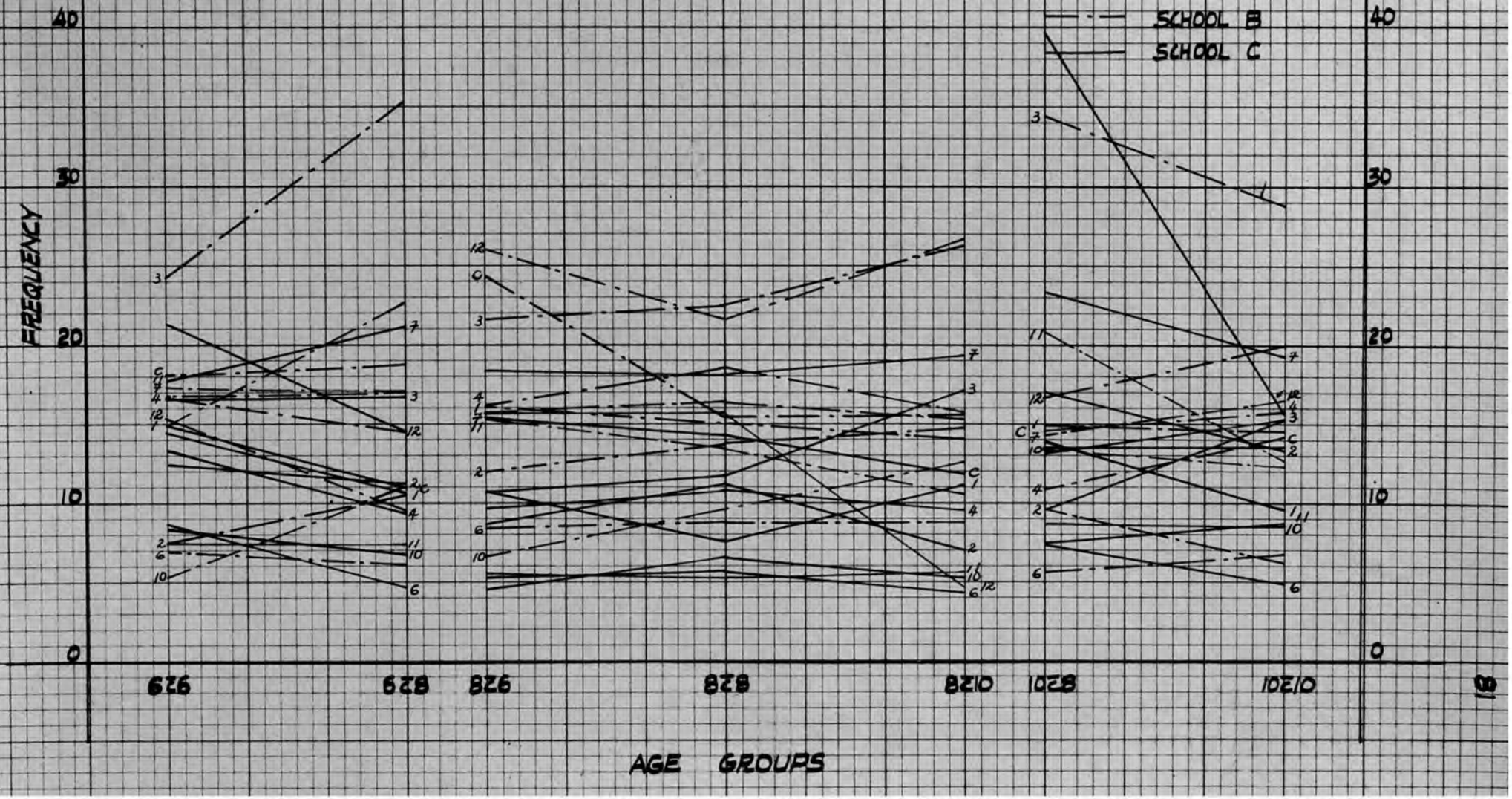


FIGURE 4.

CATEGORY I : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR.

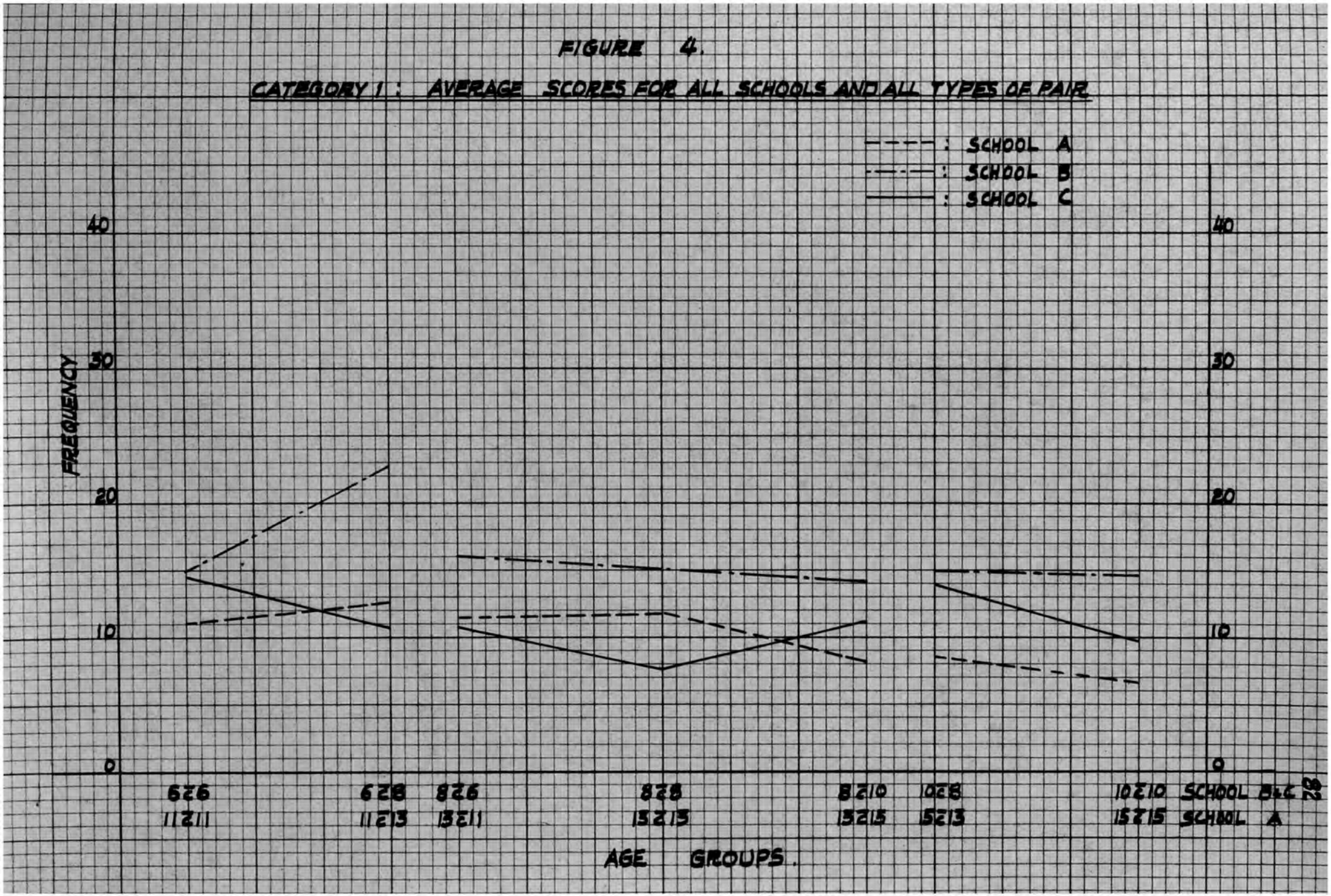


FIGURE 5.

CATEGORY 2 : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR

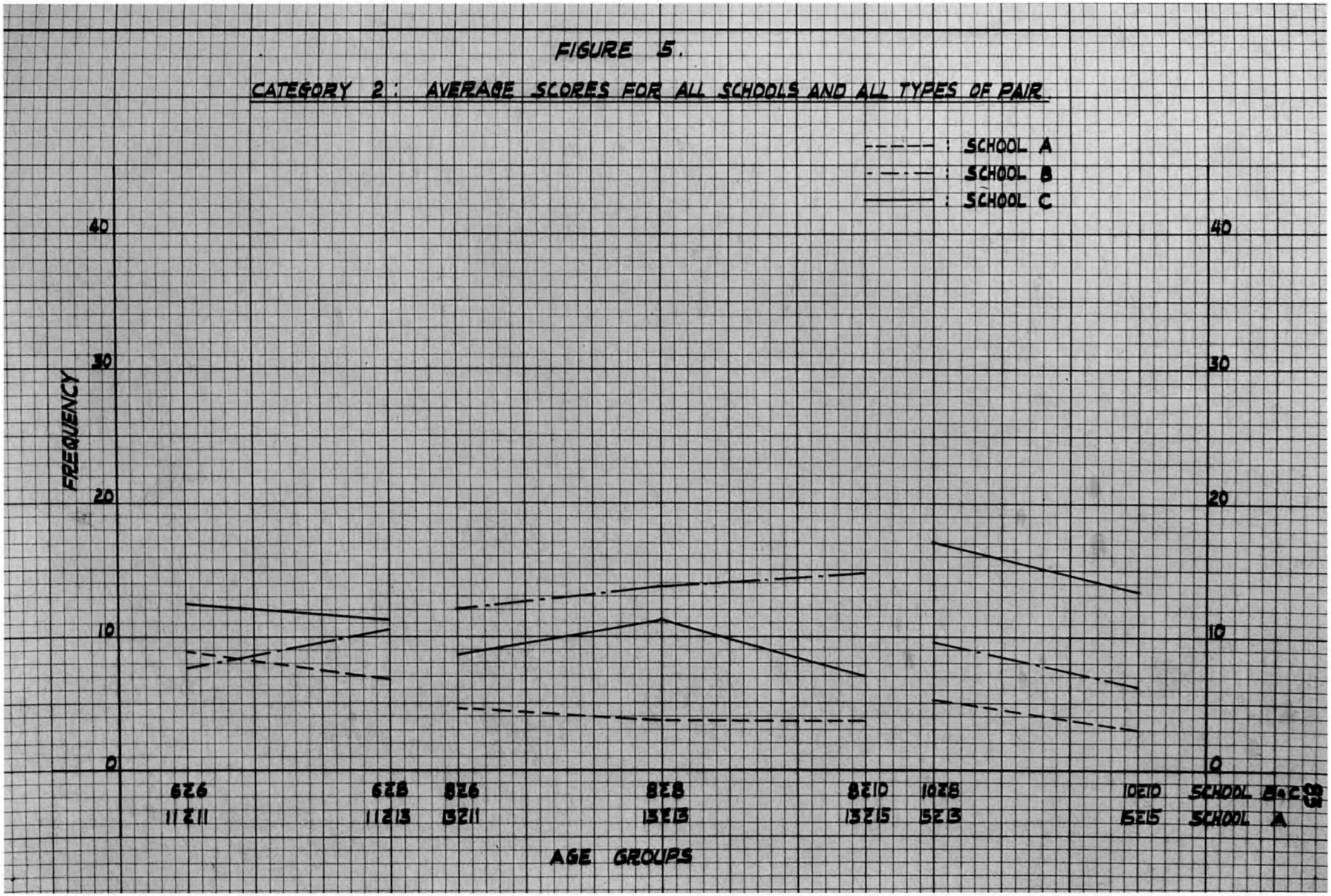


FIGURE 6.

CATEGORY 3 : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR.

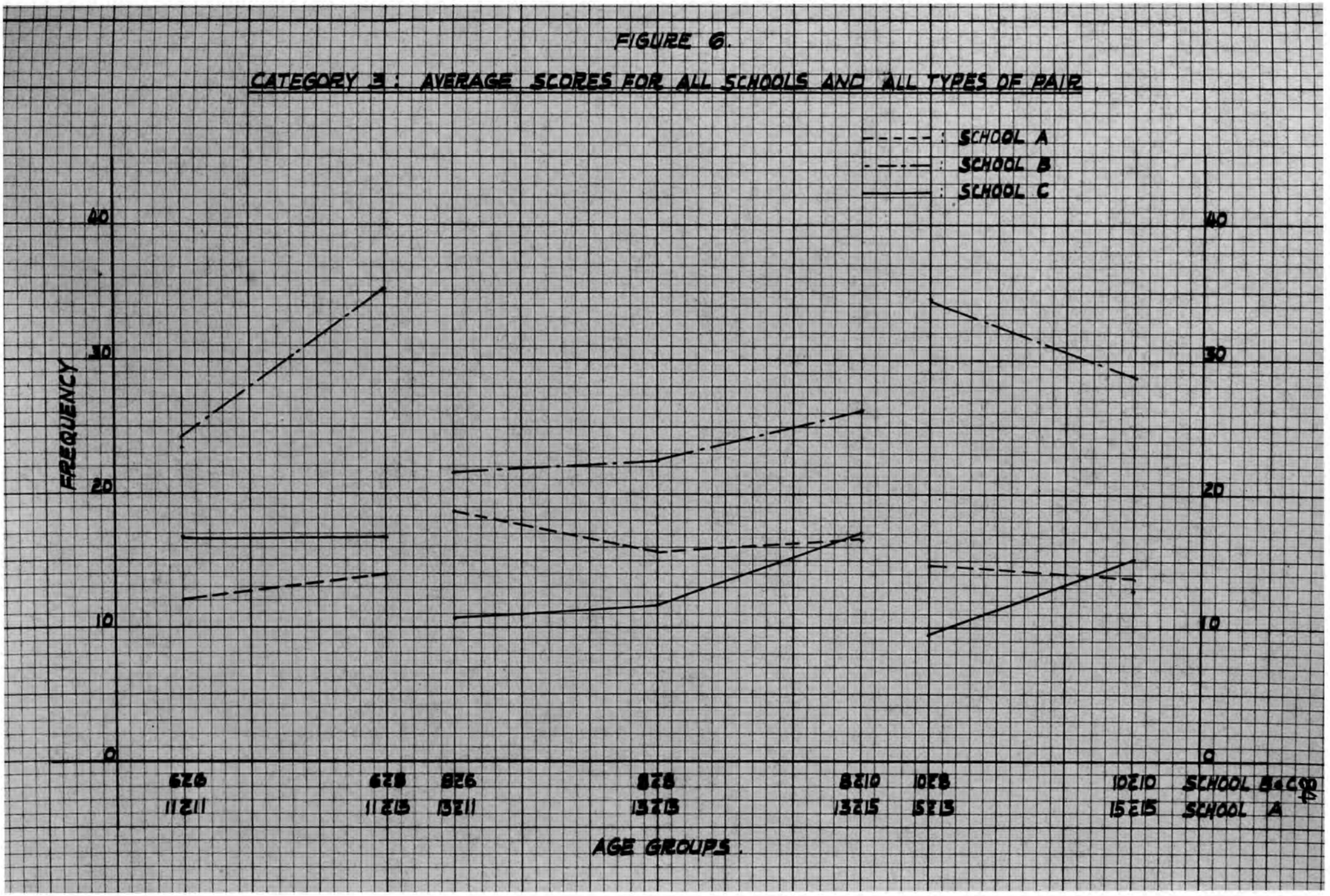


FIGURE 7.

CATEGORY 4: AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR

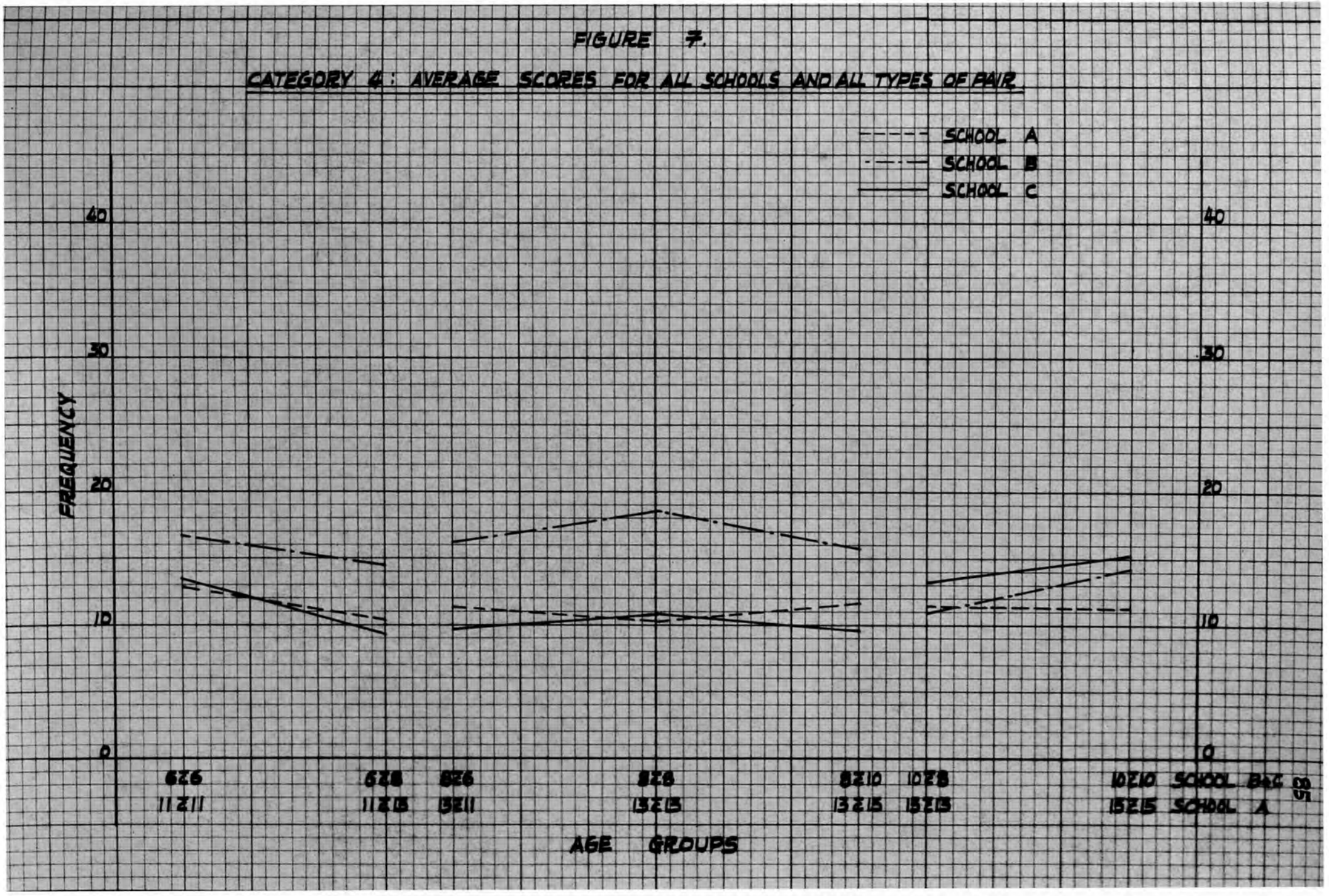


FIGURE 8

CATEGORY 6 : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR.

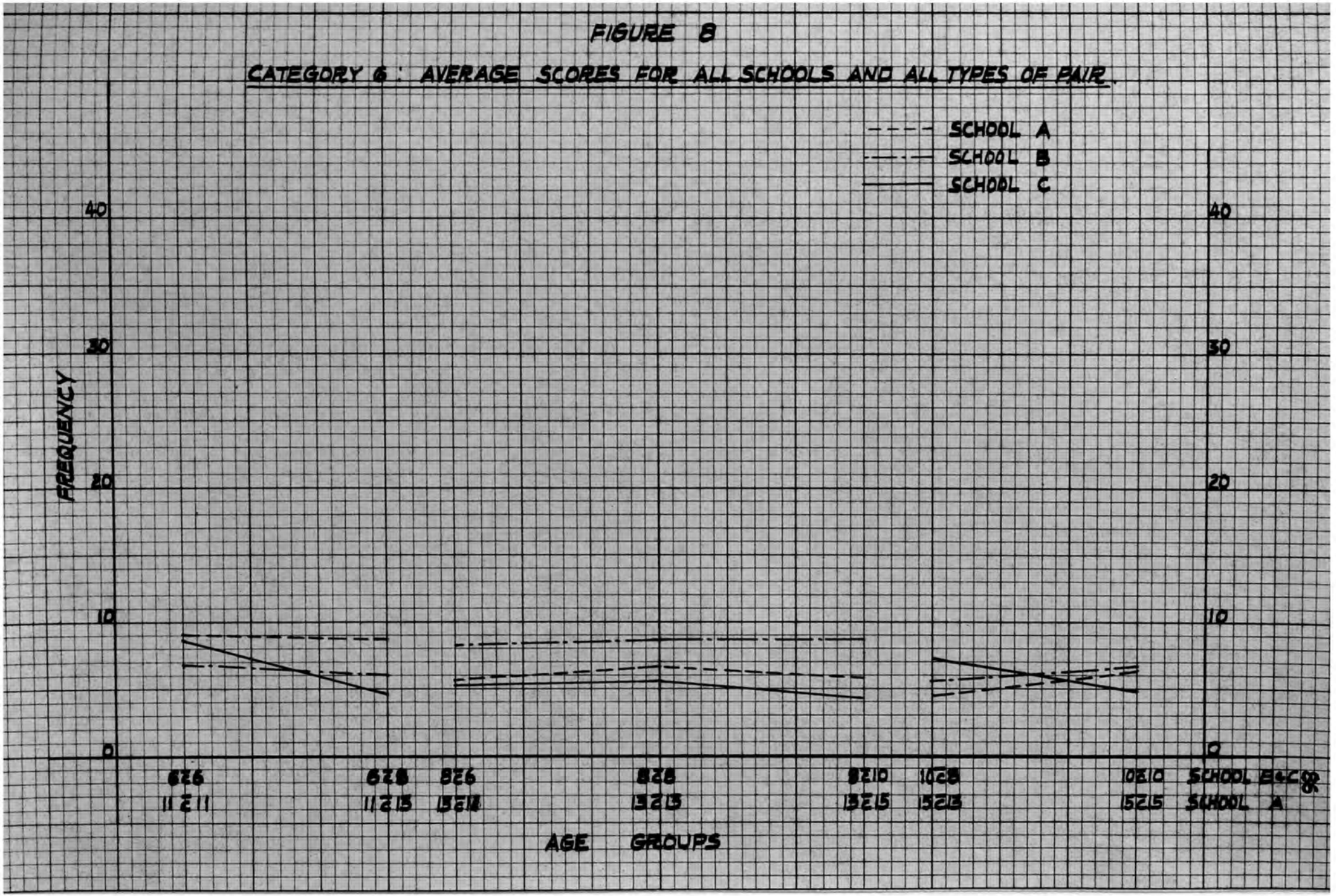


FIGURE 9

CATEGORY 7 : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR

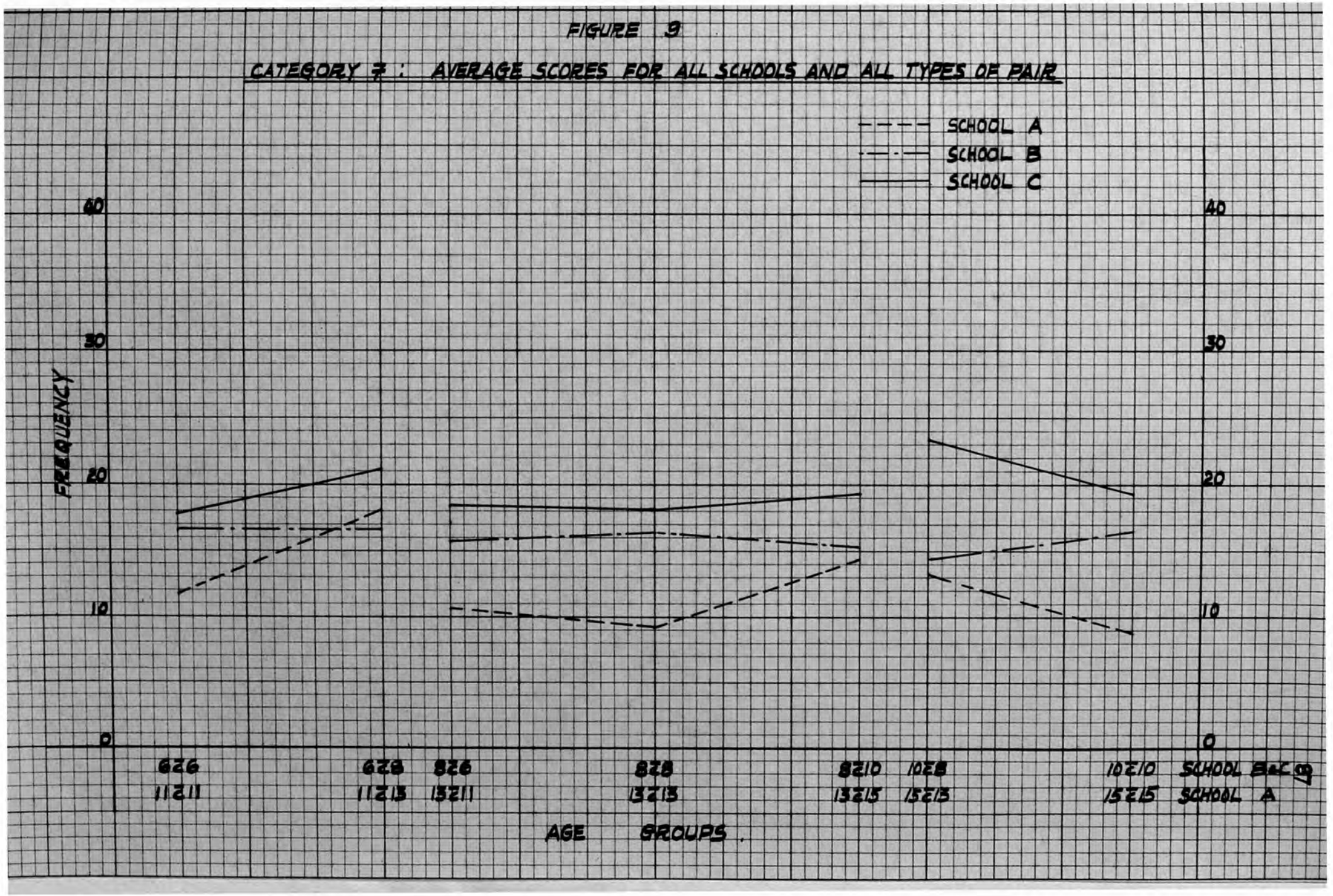


FIGURE 10

CATEGORY 10 : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR

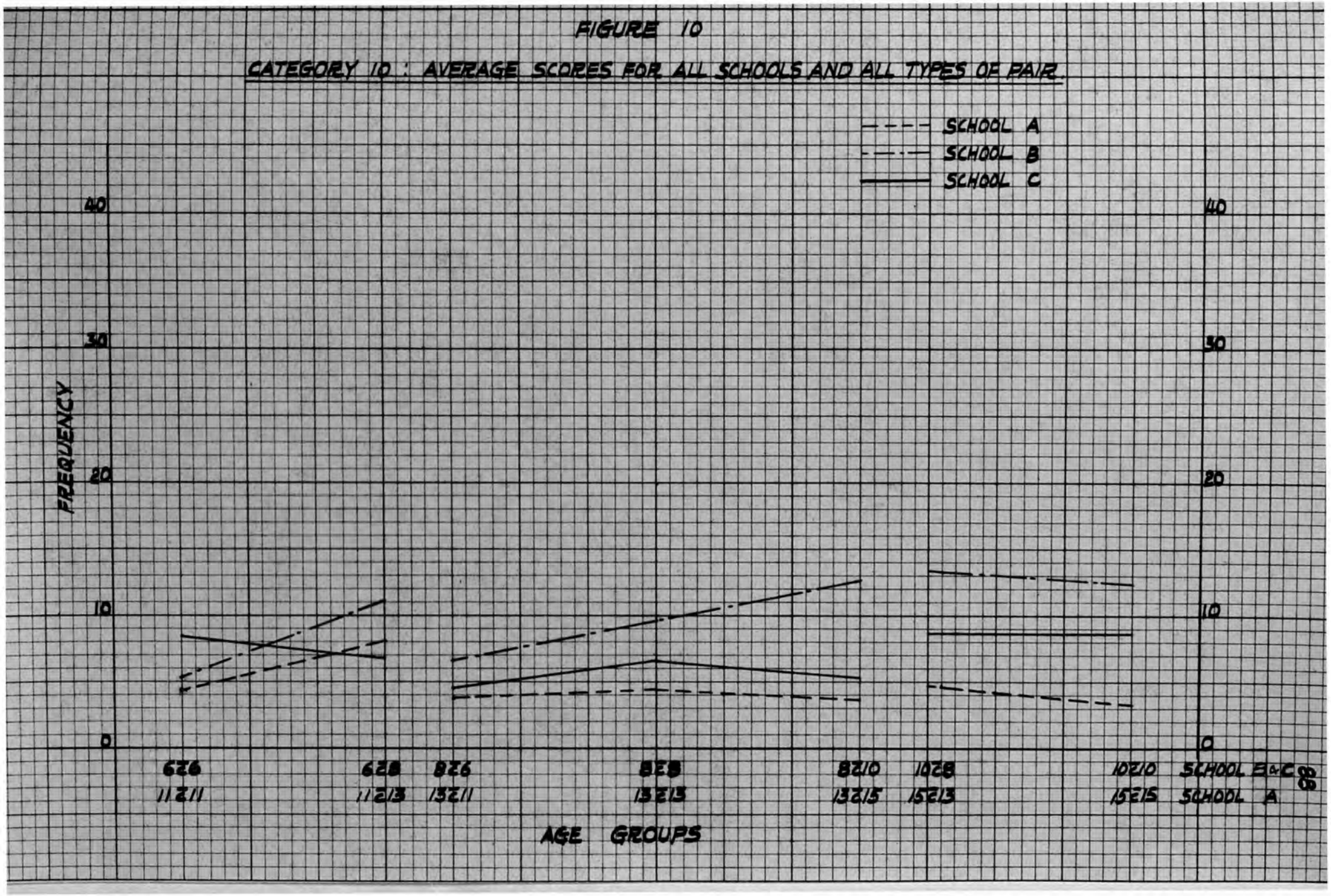


FIGURE 11

CATEGORY II : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR

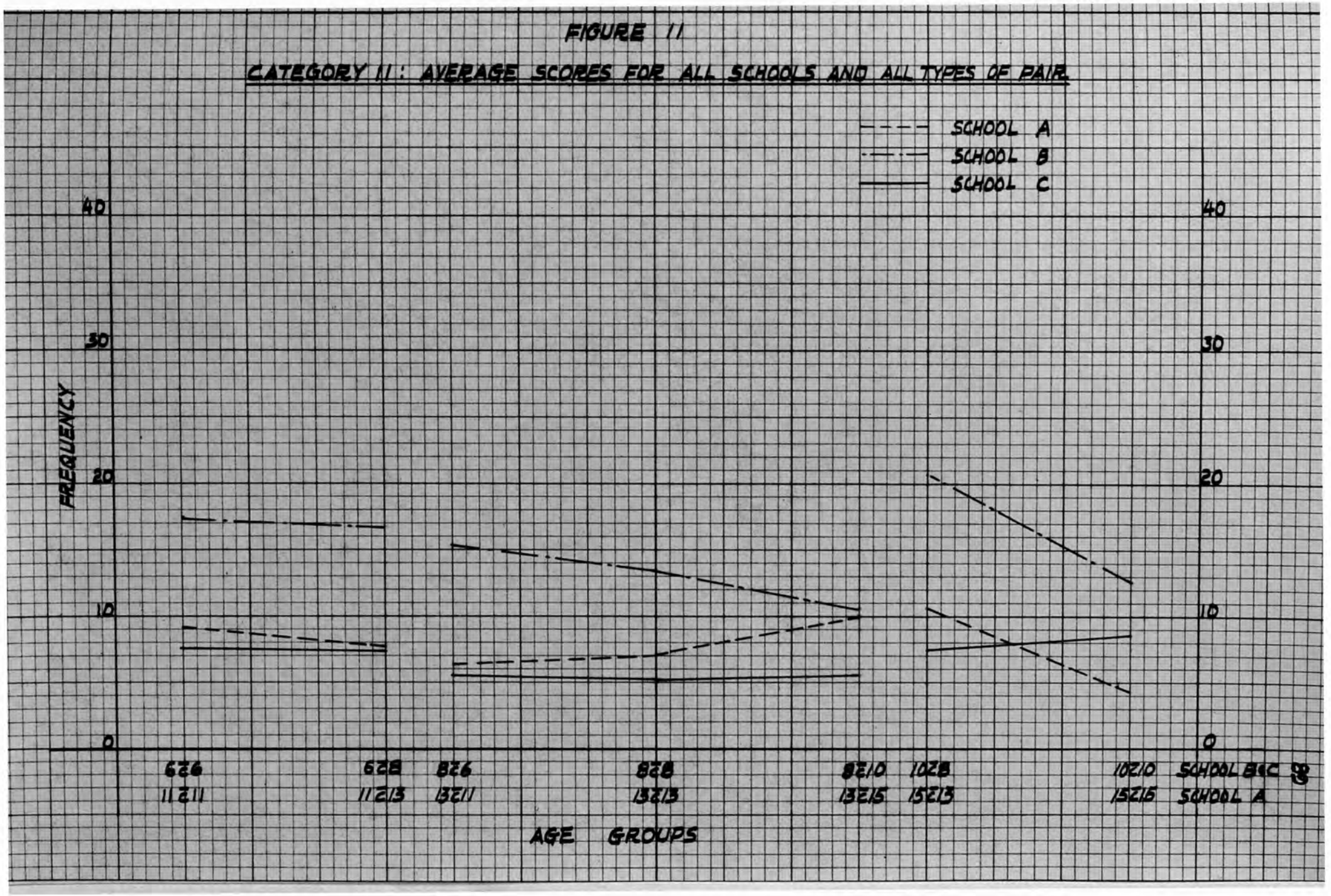


FIGURE 12

CATEGORY 12: AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR

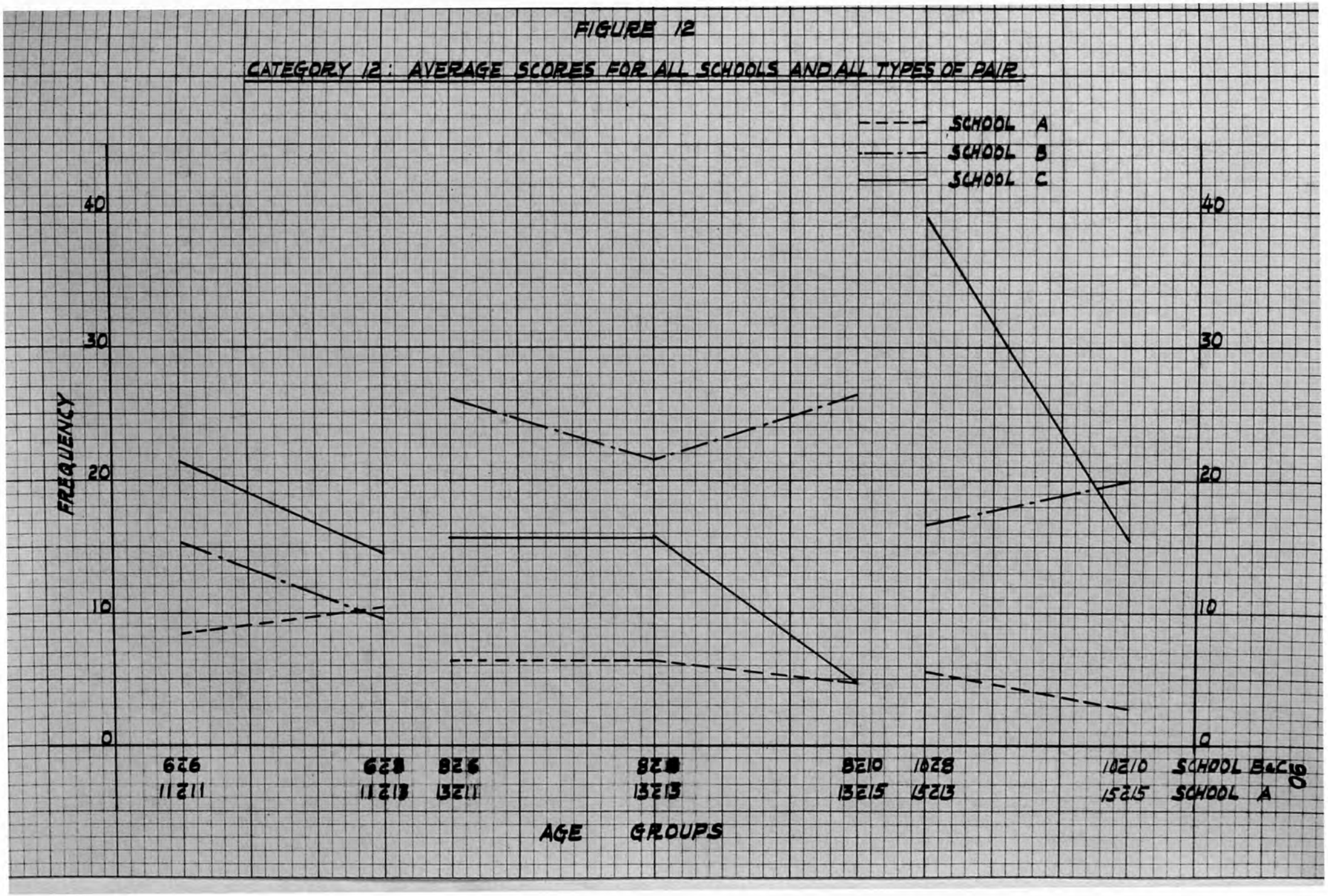
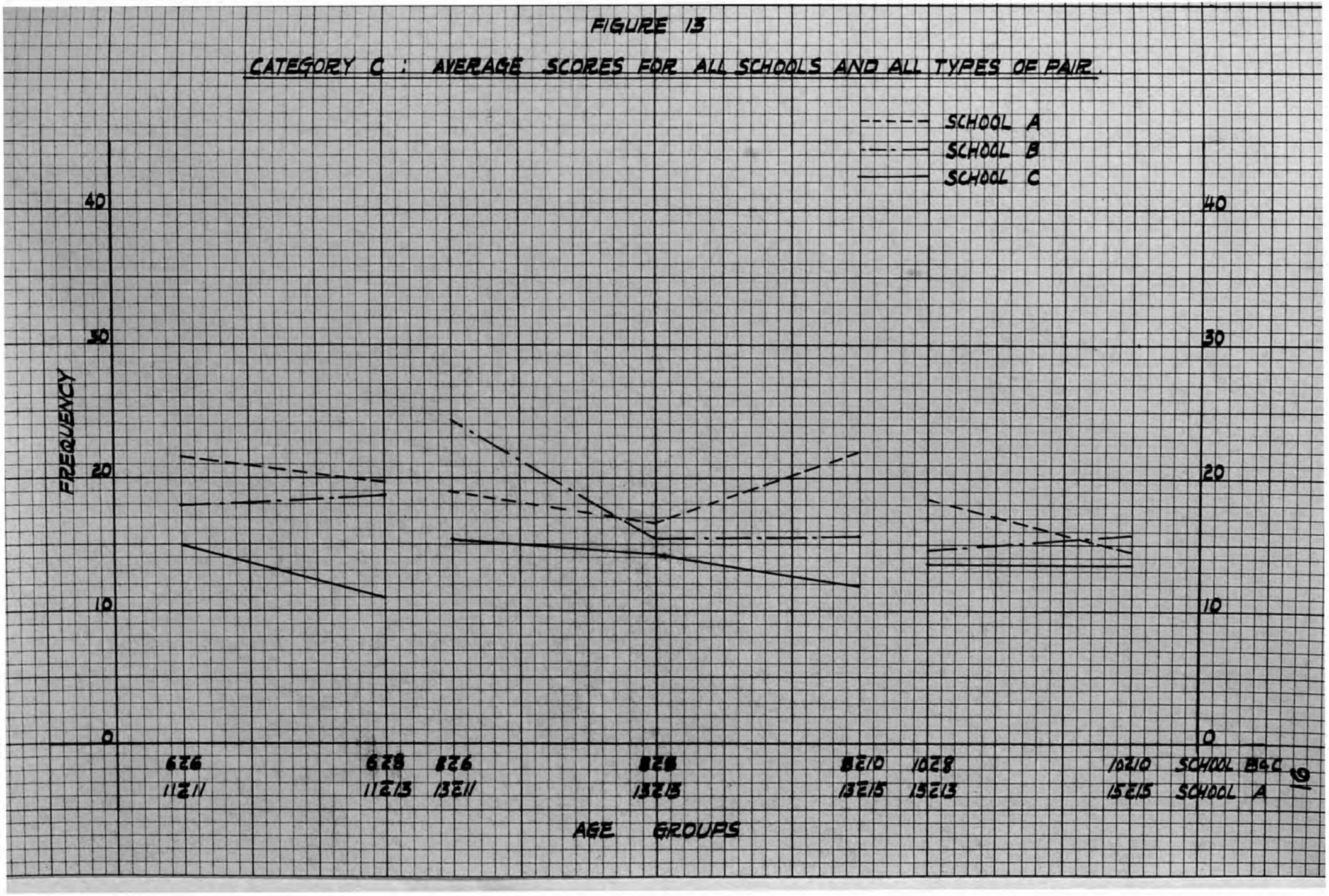


FIGURE 13

CATEGORY C : AVERAGE SCORES FOR ALL SCHOOLS AND ALL TYPES OF PAIR.



(sometimes linear and sometimes curvilinear) with increasing age. Tables 3 and 4 appear to reflect disturbances in emotional attitudes when children are paired with children of different ages. Apparently it is more disturbing to be paired with an older child than with a younger, but once again it seems likely that these patterns of disturbance change with increasing age, and are also affected by personality factors, etc.

Further Considerations

In addition to the statistical analysis just described, it is helpful to plot the average frequencies graphically. If this is done for each category and for each age group, then certain general tendencies appear. For purposes of the present discussion the relevant graphs are given as figures 1 to 13 and in Appendix F.

There are two features of interest in these graphs. These are:

(a) the starting point of each line

(b) the slope of each line.

According to Bales, his categories should balance in the sense that an increase in one category should be offset by a comparable decrease in the opposite category. In graphical terms (the relevant graphs are in Appendix F) this means that if one line (e.g., for category 1) slopes upward, then the other line (for the opposite category 12) should slope downward. Insofar as these tendencies fail to occur, some doubt is thrown on the validity of Bales' theoretical framework.

Categories 1 and 12.

With regard to categories 1 and 12, it can be seen that only in the case of School B is there a general tendency for categories 1 and 12 to counter-balance. This is in conformity with Bales' scale and with adult expectations.

In the case of School A, however, it appears that an increase in solidarity scores (category 1) tends to be accompanied by an increase in antagonism scores (category 12). It is necessary to consider why this peculiar tendency should occur, and there are several points to be noted here:

(a) There are age, personality and school differences

(b) The scores are among the lowest on the graphs. In other words, they are based on the smallest number of frequencies.

(c) The tendencies are only slight in the sense that the slopes of the lines are only small. In other words, the slope differences may not have any real significance.

(d) It is possible that in the lower age groups, a certain amount of antagonism is necessary to motivate the children. In this case the children will work better if they are arguing with each other and this might explain why there will be an increase in antagonism accompanying increase in solidarity scores. Another possibility is that hostile behaviour is normal for this kind of group <u>but is not interpreted as being hostile by the children themselves.</u>

It will be noted from the graphs that School C also tends to follow School A's patterns, although there are complications here arising from the fact that the graphs rise and fall from different positions. (Strictly speaking, these scores cannot be compared without reference to their internal variability. It would also be desirable to express the slope of the lines as percentage increases or decreases. No attempt has been made to do this, since it is not desired to place too much emphasis on rather doubtful statistical procedures).

In general, it can be said that everything depends on how much confidence can be placed in the scores obtained from just a few subjects. If the children are likely to vary a great deal among themselves, or if the same child is likely to vary from day to day in his scores, then obviously less importance can be attached to a large fall in the slope of the graphs.

In short, the data assume that children are reasonably consistent and would have given much the same results if they had been tested in different pairs or on different occasions. Even so, it is fairly clear that the Bales categories did not show much sign of balancing each other in this particular school. Because of the variability among the children of School C, it seems likely that the results have been somewhat obscured by individual differences between children (and the existence of individual differences is supported by the original raw data).

Categories 2 and 11

According to Bales, categories 2 and 11 ought to balance each other to some extent, but this is rather doubtful especially with children, who tend to be more excitable than adults and likely to show more signs of strain and tension release. From an inspection of the graphs, it can be seen that School C tends to follow the Bales pattern most closely, although there is still a fair amount of the variability mentioned earlier. In the case of School B counter-balancing does not hold for the 10 with 8 and 10 with 10 age groups. From the writer's recollection of the children, it seems likely that this last difference might have been due to individual differences in emotionality, spontaneity, etc., etc.

Once again School A did not follow the same pattern. In the 11 with 11, 11 with 13, 15 with 13, and 15 with 15 age groups a fall in category 2

is accompanied by a fall in category 11. In the remaining groups (13 with 11; 13 with 13; and 13 with 15) a slight decrease in category 2 is, however, accompanied by a slight increase in category 11, but this does not appear to be significant. Although the Bales categories did not seem to hold as well for children as for adults, it looks as if they do discriminate between different schools. In other words, Bales categories do indicate gross differences between schools, despite the fact that his categories do not seem to balance in the required manner.

Categories 3 and 10

One of the difficulties about Bales categories 3 and 10 is that they are especially subject to environmental influences. It is to be expected, for instance, that in the presence of a stranger children might be unwilling to express much disagreement, believing it to be rude. In consequence, it is difficult for a stranger to secure valid scores from these categories, since the child might be unwilling to contradict or exhibit bad temper, etc. Strong evidence for this is provided by the graphs which indicate far higher scores on agreement than on disagreement. Because of the large differences between agreements and disagreements, it is difficult to analyse the scores of categories 3 and 10 together. (As mentioned earlier, a statistical analysis would have to take into account reliability of scores, internal variability within each group, differences between groups and differences due to the fact that percentages are less reliable when based on small scores).

A further difficulty lies in the possibility that the number of disagreements tends to increase as the experiment continues. For this reason it might have been useful (had it proved possible) to have kept time records and to have analysed the data on a time basis, in order to see how

the category scores fluctuated during the course of the experimental session.

Categories 1 - 3
Categories 9 - 12

As Bales' categories are so arranged that numbers 1 to 3 form one group and numbers 9 to 12 form another group, it is now relevant to say something about these groups collectively before considering the remaining categories. The first point to note is that Bales has arranged his categories in what might be called logical pairs, e.g., agreement versus disagreement and so on. Although this gives his system a logical balance, it does not follow that these categories will oppose each other in practice. In other words, a person might show tension increase at one point and eliminate it by showing antagonism which comes under Bales category 12. As is well-known, Bales is fully aware of the "overlapping" that occurs between categories, but unfortunately he does not provide any effective procedures for handling this overlap. In view of this basic weekness of Bales' system, it is not clear how much of the variability recorded in the present experiment is due to overlapping and how much is due to other factors such as individual differences, age, schools, etc. It is also not clear what Bales means by overlapping. It might, for instance, refer to the experimenter's subjective uncertainty about classification, or it might refer to the fact that his categories are artificial and do not fit observed data very well. Or it might refer to a tendency for a category 1 response to be followed or balanced, not by a category 12 response but by some other category of response.

Categories 4 and 9

According to Bales, these two categories are respectively concerned with giving suggestions and asking for suggestions. However, it was found that in working with children category 9 responses were few and it was therefore considered advisable to disregard these in the analysis. It might have been the case that children were inhibited about asking for suggestions in the presence of a stranger, or that the material was of the kind for which questions were not likely to be asked. Further evidence is needed on this matter. What the results do show, however, is that there is no direct counter-balance for category 4, and to this extent Bales' theoretical framework did not appear to hold for children.

An analysis of category 4 alone chiefly reveals the difference between school B and the other two schools. Apart from this, the trends are rather small and this suggests that differences between ages, type of pairing etc. can be considered unimportant with respect to category 4.

Categories 5 and 8

For much the same reasons, no scores have been shown for categories 5 and 8. Possibly, the material was not the right kind to induce children to give opinions and ask for opinions. Of course, the experiment could have been designed so that children were forced to do this. For instance, one child might have been explicitly requested to comment on what the other child did. But this would have created a rather artificial situation. As already explained, the aim of the method was to give as natural a situation as possible. This has many advantages, but one of the disadvantages is that categories 5 and 8 rarely appear for this type of material.

Categories 6 and 7

These categories refer to giving and asking for orientation. The comments already made apply to these categories also. Clearly there is bound to be an element of subjectivity in determining the difference between, e.g., giving orientation, giving suggestion etc. These difficulties are even more pronounced when dealing with children, especially strange children, and it should be noted that the frequency of category 6 responses is rather low. This reflects the experimenter's general uncertainty about these categories, as already explained. (On the whole, the experimenter felt it was better to disregard these categories than to score them where she was feeling uncertain).

Although these categories 6 and 7 are supposed to balance, they do not apparently work in the same way as Bales' other categories. For instance, in a task oriented group, it might be expected that an increase in the giving of orientation would be accompanied by an increase in asking for orientation. The reason for suggesting this is that in a task oriented group one might expect a rapid interchange of ideas, with both children rapidly asking and giving orientation to each other. On the other hand, it is psychologically less probable that scores under categories 1 and 12 should increase together in this way if two children are co-operating (willingly or otherwise) on a problem-solving task, and it is not likely that friendly and hostile gestures should both increase at the same time. In view of these remarks, it is not clear what is to be expected with regard to categories 6 and 7. A superficial reading of Bales might suggest that an increase in category 6 should be accompanied by a decrease in

in category 7, and vice versa, whereas it is suggested that categories 6 and 7 should tend to increase together. From an inspection of the graphs, it seems that both of these cases arise. In order to probe these differences it would be necessary to run personality tests on the children (e.g. by means of the Rigidity Scale of Adorno) and to find out how they reacted to mutual orientation.

Apart from this, not a lot can be inferred from the graphs because there is no clear hypothesis to be tested (e.g. an increase in 1 in accompanied by a decrease in 12). But it does look as if schools might have been found to differ significantly with respect to categories 6 and 7, if a more extensive enquiry had been undertaken. Perhaps it should be mentioned here that the data could not be statistically tested in detail for significant differences between schools, because the analyses actually carried out (on age, pairing, and category differences etc.) proved to be too unclear. Presumably it goes without saying that schools differ in certain overall senses.

Categories 4 - 6
Categories 7 - 9

In Bales' original framework categories 4 to 9 are divided into two groups, half of which are concerned with attempted answers and half with attempted questions. Since no data are recorded on categories 5, 8 and 9, it is possible only to contrast categories 4 and 6 with 7. It will also be recalled that frequencies in category 6 are small and that there is considerable difficulty in applying this particular category to the kind of task actually used in the experiment. (As already mentioned, it is difficult to distinguish between giving opinions and giving orientation with the kind of material and subjects actually used).

With these reservations, the following points can be made:

(a) Categories 4 and 6 do not, on the whole, show marked differences in slope, but these two categories taken together do seem to be different from category 7. A qualitative inspection of the graphs, therefore, supports the earlier contention that categories 4 and 6 are difficult to separate and that they may or may not be accompanied by a similar score in category 7.

(b) On the whole, category 7 is more different from category 6 than it is from category 4. Perhaps this may be regarded as very slight evidence in favour of Bales' contention about categories 6 and 7 counter-balancing to some extent.

Apparently nothing more can be said about this comparison having regard to the uncontrolled factors, the smallness of the frequencies and the vagueness of the Bales' categories.

Category C

In addition to using the Bales' categories, an attempt was made to introduce a "compound" category which, roughly speaking, refers to concentration and is designated "C". The idea here is that the social relationships in small groups are likely to be affected quite considerably by the extent to which the members concentrate on the task in hand. For instance, a person who concentrates hard on a task might show considerable antagonism when interrupted, despite the fact that the interruption is made with the best intentions. Perhaps one way of looking at the concentration factor is to think of it as a combination of positive-task involvements and positive-emotional attitudes in which both of these factors are related to levels of aspiration. The concept of "level of aspiration" is

important here because there is abundant evidence that group members would not concentrate on tasks which are outside what they considered to be their range of ability.

The concentration category might also be regarded as a form of protest against the Bales' framework. The point here is that it is unrealistic to mark a person as showing antagonism, tension, etc., without having regard to his level of aspiration or general ego involvement in the task. For convenience, the concentration category has been placed midway between categories 6 and 7 to preserve the symmetry of Bales' system, but it must be stressed that a factor of concentration is inferred from evidence which ranges over a large number of Bales' categories and takes into account such facts as facial gestures and general posture. Instead of thinking of the factor as falling midway between Bales' system, it might perhaps be better to think of it as a more global category which is sensitive to several factors simultaneously. A strength of the C category is that it does not try to "reduce" behaviour to a series of observable body movements, or to isolated acts of communication. In other words, category C functions as a corrective to Bales' technique which errs on the side of breaking down the behaviour too much. To put the point in another way, it seems to be a weakness of Bales' scheme that it divorces the individual actions from their social context. For instance, there is a considerable difference between showing antagonism when one is interrupted in the middle of concentration and the showing of antagonism for other reasons. What makes behaviour meaningful is the social context in which it occurs, and for this reason much information is lost by breaking down behaviour into a succession or a series of agreement, opinions, orientation, etc.

It must be noted that a concentration category differs in one other way from the Bales categories, since it refers to a general attitude that persists over time. The point about the Bales categories is that they all refer to more or less isolated components of an interaction process - for instance, asking for a suggestion as a single identifiable act which gives way to some other identifiable acts. On the other hand, the concentration factor is scored at a more general level and is not determined by just one isolated action. For instance, a child would not be scored as showing concentration just because he is standing up, but he would be scored for concentration if he is too engrossed in the task to sit down. No doubt it is obvious that the 'C' category is more subjective than any of the Bales categories. To give a child a 'C' score is to make an inference about the child's state of mind - on the basis of a variety of possible behavioural signs.

An inspection of the graphs for category C reveals the following points:(See figure 13.)

(a) There appear to be slight school differences which are reflected by the distance apart from the three graphs in each section.

(b) School C has a systematic low score throughout.

(c) The children of Schools A and B both seem to concentrate harder than the children of School C. In the case of School A, the additional concentration may be due to the fact that these children had a comparatively low I.Q. (in view of chronological age) and attempted to compensate by trying harder.

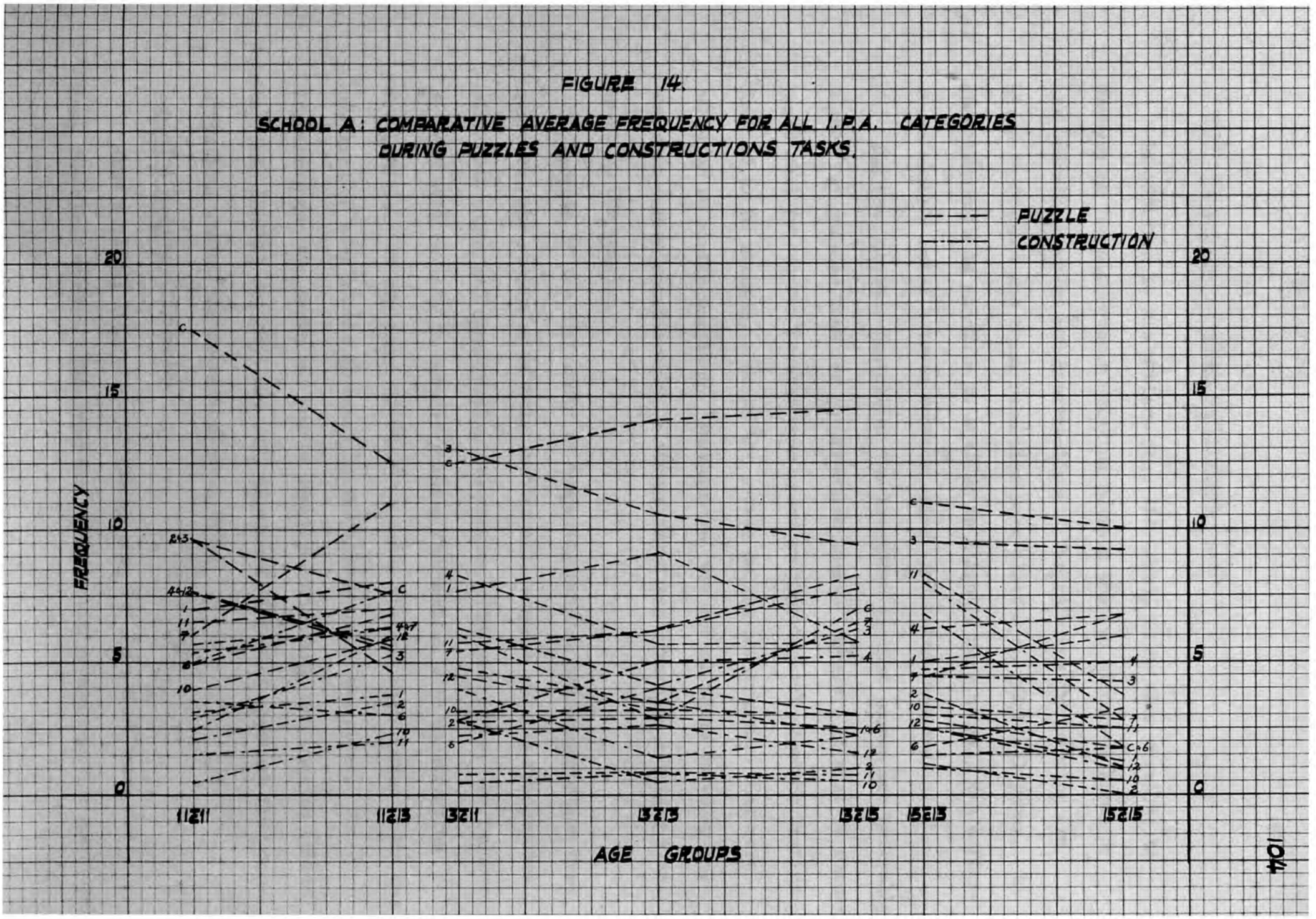
This hypothesis may be somewhat controversial. From one point of view a child with a comparatively low I.Q. might be expected to concentrate more in order to solve the problem which a normal child would solve with very little effort. From another point of view, it might be thought that a child with a comparatively low I.Q. might find it difficult to concentrate at all. A difficulty here is to decide from observation what should count as an act of concentration. If the normal child is concentrating, his behaviour manifestations may well be different from those exhibited by a more backward child who is also concentrating. In the actual experiment the writer tried to overcome this difficulty by scoring only those acts of behaviour which were most reliable. (See appendix A.) Also involved in School A, there appears to be an age factor, but this is not very marked.

If Category C is to be useful, then some attempts must be made to relate it to the other Bales categories. The graph for category C has therefore been compared with the other graphs and it turns out that it shows quite a close resemblance to the graphs of categories 2 and 4. This strongly supports the earlier suggestion that the concentration factor is a combination of positive emotional attitudes and positive task involvement. For if a child is concentrating on a task, it is to be expected that he will show tension release and satisfaction etc. (Category 2), whenever there is evidence that he is nearing the solution of the problem. In the same way, if he is concentrating on the task, it is to be expected that he will give suggestions etc. (Category 4).

If this line of reasoning is correct, and if it is true that concentration overlaps with categories 2 and 4 chiefly, it may be of interest for future studies to devise indicators of <u>lack</u> of concentration, thus making the data more meaningful and informative.

FIGURE 14.

SCHOOL A: COMPARATIVE AVERAGE FREQUENCY FOR ALL I.P.A. CATEGORIES DURING PUZZLES AND CONSTRUCTIONS TASKS.



Task Differences

In addition to the matters just discussed, it is also possible to comment on the differences existing between the two different kinds of task namely, puzzles and constructions. The relevant frequencies are given in figures and these have also been plotted in graphical forms. In consequence it is possible to analyse in slightly more detail, the differences already noted between schools, ages, and categories etc.

The most obvious feature of the breakdown is that scores are generally higher for puzzles than for construction tasks. However, it must be remembered that scores for puzzles were based on experimental sessions lasting from 10 to 20 minutes, whereas the scores on the construction task were based on 10 minute sessions. Furthermore, the actual times taken by the children varied considerably, although there was generally a longer time spent on the puzzles.

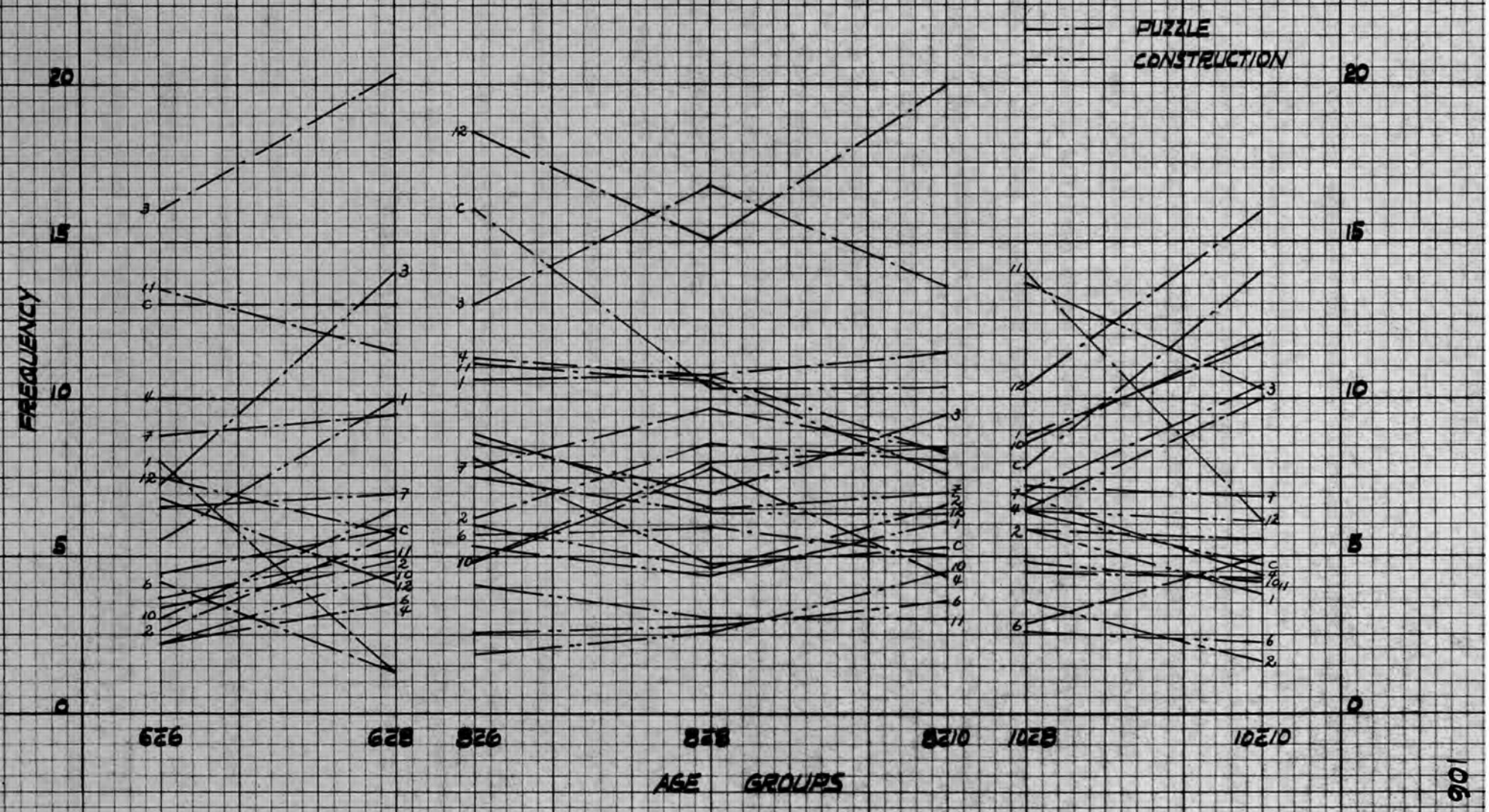
Because of the difficulty of comparing puzzles and construction frequencies, the remainder of this section will compare puzzles frequencies with each other and construction frequencies with each other. No further attempt will be made to compare puzzles frequencies with construction frequencies. In any case, it is by no means obvious that scores under the one kind of task should be equal to the scores under the other. For instance, the two tasks may not be equally motivating, and puzzles (which tap intellectual ability) may well require a different approach from constructions (which tap mechanical ability).

School A Results (figure 14)

From a visual inspection of the graphs, it seems that there are very few clear trends. With respect to the positive and negative emotional

FIGURE 15

SCHOOL B: COMPARATIVE AVERAGE FREQUENCY FOR ALL I.P.A. CATEGORIES DURING PUZZLES AND CONSTRUCTIONS TASKS



areas, there is slight evidence in favour of Bales' belief that categories 1 to 3 and 10 to 12 counter-balance. This trend is clearer for the puzzles scores than for the construction scores. Assuming that the Bales system really does show balancing tendencies, their absence in the construction graph may be due to the fact that the construction task involves more thinking and less overt activity. Whatever the explanation, there is certain evidence here that the two tasks had different characteristics as far as emotional attitudes were concerned. It may be worth noting that concentration scores (category C) would be much higher in respect of the construction task if we allow for the difference in the time taken. This supports the view that the method of approach to the two kinds of problems may be different and therefore shows different score patterns on the Bales categories.

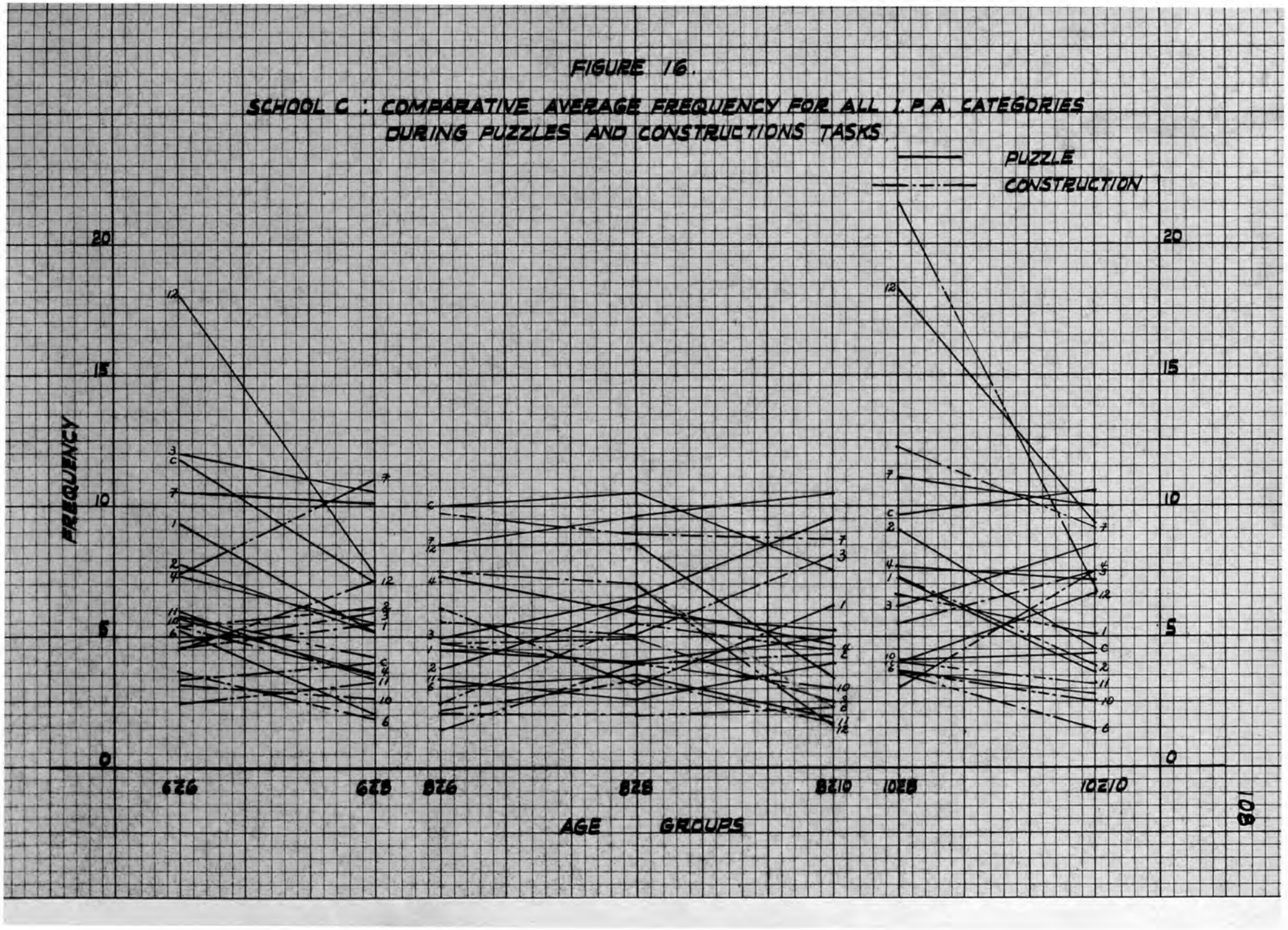
With respect to the remaining categories 4, 6 and 7, it may be noted that the construction frequencies are relatively higher, having regard to the much shorter time interval in which they occur. This means, of course, that there is (according to Bales) greater task involvement in the construction task. Once again, this is consistent with the remarks already made concerning higher level of concentration and less overt activity.

School B Results (figure 15)

In this school the counter-balancing tendencies between positive and negative emotional areas are still less marked. This suggests that these children show less difference than do those of School A in their approach to the two kinds of problems. This point can be well illustrated

FIGURE 16.

SCHOOL C : COMPARATIVE AVERAGE FREQUENCY FOR ALL I.P.A. CATEGORIES DURING PUZZLES AND CONSTRUCTIONS TASKS.



by comparison of the category 12 graph of the two schools. If these two graphs were adjusted for time, it would be seen that these children have rather similar emotional approaches to the two kinds of problems. It can also be seen that there is not a great deal of difference in concentration scores once these have been adjusted for the time factor.

The remaining categories 4, 6 and 7 do not give much additional information because the frequencies are small and somewhat irregular (from one child to the next).

School C Results (figure 16)

The graphs in respect of positive and negative emotional areas are somewhat confused in the case of School C and no definite patterns emerge. In the case of category 12 there are some fairly dramatic changes as between age groups. These changes are indicated by a sharp slope in the graphs. Because of the individual differences between subjects, it is not clear from the data whether or not these changes are significant, but they are certainly worth investigating further.

The category C scores for School C seem to follow much the same pattern as School B. In other words, when adjusted for the time factor, there is not a great deal of difference between the two kinds of task.

The remaining categories for 4, 6 and 7 show very few trends, although there is a definite tendency for scores to be higher in respect of the construction task, having regard to the different times. This suggests that general task involvement may be higher in the case of the construction problems.

TABLE 5

Summary of direction of change in category 1 frequencies when working with older or younger children compared with a like aged child.

With an older child					With a younger child				
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	3	1	1	1	13yr 11yr	2	1	2	-
13yr 15yr	1	1	3	3	15yr 13yr	-	2	3	1
Totals	4	2	4	4		2	3	5	1
School B					School B				
6yr 8yr	4	6	2	-	8yr 6yr	1	3	3	3
8yr 10yr	1	4	4	2	10yr 8yr	2	4	3	1
Totals	5	10	6	2		3	7	6	4
School C					School C				
6yr 8yr	1	3	5	2	8yr 6yr	2	4	4	1
8yr 10yr	4	5	2	1	10yr 8yr	5	3	1	2
Totals	5	8	7	3		7	7	5	3

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

General Conclusion as to Task Differences

No differences consistent for all three schools can be detected between the approach to the two sorts of task. Only in School A results does it appear that the construction tasks produced higher concentration scores than did the puzzles.

Age Effects

Now that the main differences have been discussed, it is possible to give some attention to the differential effects of working with partners of different ages. It will be convenient to do this for each category in turn and for each score, and the appropriate results are given in Figures 4 to 13, and Tables 5 to 14. Figures 1, 2 and 3 summarise the results.

(Effects of working with older child) Category 1 (figure 4)(table 5)

School A

In this case there appear to be no significant differences due to the age factor.

School B

An inspection of this figure shows that there are about twice as many positive differences as negative. This suggests that when a child works with an older child his "positive emotional scores" (under Bales' category 1) increase. In other words, children show increased solidarity when working with an older child (as compared with a child of the same age).

This result conflicts with the earlier suggestion that children generally show less solidarity when working with an older partner. However, School B was rather exceptional in having high positive emotional scores throughout. Furthermore, it is worth remarking that the two age groups are not based on exactly the same task. This means that the increases

TABLE 6

Summary of direction of change in category 2 frequencies when working with older or younger children compared with a like aged child.

With an older child					With a younger child				
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	-	3	4	1	13yr 11yr	1	3	2	-
13yr 15yr	3	2	1	1	15yr 13yr	3	1	1	-
Totals	3	5	5	2		4	4	3	-
School B					School B				
6 yr 8 yr	3	3	2	2	8yr 6yr	2	5	3	1
8yr 10yr	3	3	3	3	10yr 8yr	3	2	2	-
Totals	6	6	5	5		5	7	5	1
School C					School C				
6yr 8yr	1	3	4	3	8yr 6yr	1	2	5	4
8yr 10yr	4	2	2	2	10yr 8yr	3	4	1	1
Totals	5	5	6	5		4	6	6	5

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

in category 1 frequencies may have something to do with the fact that the construction of the church may be more difficult than the constructions of the engine.

School C

In the case of this School, the proportion of positive differences is smaller than that observed for School B and no significant differences appeared to be present.

(Effects of working with younger child) Category 1 (figure 4)(table 5)

School A

There are no significant differences due to the age factor.

School B

An inspection of this figure also shows that there are no significant differences between age groups. In other words, category 1 scores do not alter significantly when a child is paired with a younger child. It therefore looks as if children behave in much the same way when problem solving with other children of their own age or the younger age.

School C

Among these children there is a slight tendency for differences to be positive rather than negative, but this tendency is not significant.

(Effects of working with older child) Category 2 (figure 5)(table 6)

School A

In this school consistency is much less marked than in the other schools and it appears to make very little difference if a child is paired with an older partner. Because of the differences in chronological age it is not to be expected that this school would necessarily show the same patterns of change as the other two schools.

School B

In this figure rather large individual differences seem to be present and these differences are consistent for both kinds of task. In other words a positive difference on the puzzles task is accompanied by a positive difference on the constructions task. This is the sort of result which could hardly have occurred by chance, so it must be assumed that the individual differences are genuine. This supports the evidence given elsewhere that children differ among each other when paired with an older partner - some showing more tension release and others showing less.

School C

In this case the results are not quite as consistent as in School B but the trends towards consistency still exist and the same comments can be made. In other words there are individual differences among children with respect to this category.

(Effects of working with younger child) Category 2 (figure 5)(table 6)

School A

In this case it does not seem to make much difference if a child is paired with a younger partner. In some cases there is slight increase in tension release and in other cases slight decrease. Probably these figures represent random variations.

School B

It can be seen from figure 5 that most differences are positive. In other words the School B children tend to show more tension release when paired with a younger partner than they do when paired with a partner of the same age.

TABLE 7

Summary of direction of change in category 3 frequencies when working with older or younger children compared with a like aged child.

With an older child					With a younger child				
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	1	4	1	-	13yr 11yr	1	3	2	-
13yr 15yr	1	2	3	2	15yr 13yr	3	2	1	1
Totals	2	6	4	2		4	5	3	1
School B					School B				
6yr 8yr	4	5	2	1	8yr 6yr	1	3	5	3
8yr 10yr	4	5	2	1	10yr 8yr	2	3	3	2
Totals	8	10	4	2		3	6	8	5
School C					School C				
6yr 8yr	2	4	4	2	8yr 6yr	2	4	4	2
8yr 10yr	5	2	1	3	10yr 8yr	2	1	4	5
Totals	7	6	5	5		4	5	8	7

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

School C

The results for this school are rather mixed and there seem to be differences due to age. When an eight-year old child is paired with a younger partner there appears to be less tension release. But when a ten-year old child is paired with a younger partner there appears to be more tension release. This seems to be one of those differential age effects which need further investigation and which might possibly be associated with developmental stages.

(Effects of working with older child) Category 3 (figure 6) (table 7)

School A

Here, the results are rather inconclusive. Among the older children there appears to be more passive acceptance (for an older partner) in the case of constructions task. Apart from this, no obvious trends appear.

School B

Here there is an overall tendency for differences to be positive rather than negative. In other words children tend to show more passive acceptance when paired with an older partner.

School C

In this school the tendency to show more passive acceptance is not nearly so marked and individual differences seem to be present.

(Effects of working with younger child) Category 3 (figure 6) (table 7)

School A

In this school agreement, passive acceptance, etc. appear to increase when a child is paired with a younger partner. It is not quite clear why this should happen but it is possible that the older partner may lack initiative or feel that the task is beneath him.

TABLE 8

Summary of direction of change in category 4 frequencies when working with older or younger children compared with a like aged child.

	With an older child					With a younger child			
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	-	2	3	2	13yr 11yr	2	-	1	4
13yr 15yr	3	3	1	1	15yr 13yr	2	1	2	2
Totals	3	5	4	3		4	1	3	6
School B					School B				
6yr 8yr	3	1	3	4	8yr 6yr	3	-	3	5
8yr 10yr	3	1	3	4	10yr 8yr	2	3	4	3
Totals	6	2	6	8		5	3	7	8
School C					School C				
6yr 8yr	1	2	4	4	8yr 6yr	4	2	2	2
8yr 10yr	4	2	2	2	10yr 8yr	2	2	3	4
Totals	5	4	6	6		6	4	5	6

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

School B

As might be expected the majority of children show less passive acceptance when paired with a younger partner. But these differences are not particularly large and there is one striking exception in the case of Rosaline who consistently shows much more passive acceptance towards the ideas of her younger eight-year old partner.

School C

In this school the majority of children again showed less passive acceptance of younger partners and this is particularly true of ten-year olds working with eight-year old partners. It is interesting to notice that eight-year olds tend to show rather more passive acceptance toward the very youngest six-year old group in respect of the constructions task. Perhaps they might have felt that this kind of task is one in which the younger child might be equally competent.

Effects of working with an older child) Category 4 (figure 7) (table 8)

School A

In this case the tendency for negative differences to exceed positive differences in number and size is not confirmed, but it may be that the difference between 11 and 13 years old is less important than the difference between the other age groups.

School B

In this figure it can be seen that there are more negative differences than positive differences. Presumably, a child does not feel he should make suggestions to an older child when both are trying to solve the problem. This figure suggests that children are most likely to make suggestions if they are both of the same age group. If the age differs in any way, that is, either younger or older, this is likely to inhibit the

TABLE 9

Summary of direction of change in category 6 frequencies when working with older or younger children compared with a like aged child.

With an older child					With a younger child				
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construction	puzzles	construction	School A	puzzles	construction	puzzles	construction
11yr 13yr	2	2	2	2	13yr 11yr	-	2	4	1
13yr 15yr	1	1	2	2	15yr 13yr	-	1	4	2
Totals	3	3	4	4		-	3	8	3
School B					School B				
6yr 8yr	2	4	4	2	8yr 6yr	2	2	3	2
8yr 10yr	1	4	4	2	10yr 8yr	-	2	5	1
Totals	3	8	8	4		2	4	8	3
School C					School C				
6yr 8yr	-	1	6	5	8yr 6yr	-	2	3	3
8yr 10yr	1	2	3	-	10yr 8yr	2	4	2	-
Totals	1	3	9	5		2	6	5	3

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

giving of suggestions.

School C

In this case there is a very slight tendency for negative differences to exceed positive differences in number and size. This is consistent with the findings of School B and suggests that children may be slightly inhibited from making suggestions to an older child.

(Effects of working with younger child) Category 4 (figure 7) (table 8)

School A

In this table there are more negative differences than positive differences. This suggests that there is a tendency for a child to give few suggestions when paired with a younger child. It may be that a child is unwilling to admit to a younger child that he is less able to solve a problem.

School B

The school A tendency does re-appear in the case of these children because there is a definite tendency in this case for older children to give fewer suggestions.

School C

The effects noted in respect of schools A and B are not confirmed in this case. In other words, there is no tendency for School C children to give fewer suggestions when paired with the younger child.

(Effects of working with older child) Category 6 (figure 8)(table 9)

School A

In this case there is a slight tendency for negative differences to exceed positive differences. This suggests that these children are less inclined to give orientation to an older partner.

School B

In this table it seems as if it makes no difference to the category 6 if a child is paired with an older child. It may be that there are individual differences here. In other words, there might be some children who try to be polite and helpful in the presence of an older child, in which case they may be expected to give orientation, etc. On the other hand, there may be children who are inhibited in the presence of older children and consequently will give less orientation. It was not possible to check on this personality variable in the experiment.

School C

In this case there is a more marked tendency than in School A for negative differences to exceed positive differences.

(Effects of working with younger child) Category 6 (figure 8)(table 9)

School A

In this case negative differences clearly predominate and it certainly looks as if some of these children are unwilling to give orientation to younger children.

School B

In this table there is a tendency for differences to be negative rather than positive, though this tendency is probably not significant. Perhaps the most that can be said about these figures is that children tend to give less orientation when paired with younger children. It may be that a child who is paired with a younger child often tends to act on his own initiative rather than give orientation to his partner. This possibility might also be largely independent of any effects in the positive or negative emotional areas.

TABLE 10

Summary of direction of change in category 7 frequencies when working with older or younger children compared with a like aged child.

	With an older child					With a younger child			
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construction	puzzles	construction	School A	puzzles	construction	puzzles	construction
11yr 13yr	4	2	-	2	13yr 11yr	1	2	2	2
13yr 15yr	3	4	1	-	15yr 13yr	-	4	3	-
Totals	7	6	1	2		1	6	5	2
School B					School B				
6yr 8yr	3	3	2	2	8yr 6yr	2	3	3	2
8yr 10yr	2	3	4	2	10yr 8yr	1	2	4	2
Totals	5	6	6	4		3	5	7	4
School C					School C				
6yr 8yr	2	6	2	-	8yr 6yr	2	4	4	2
8yr 10yr	3	2	2	4	10yr 8yr	4	5	2	1
Totals	5	8	4	4		6	9	6	3

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

School C

In this table there is no obvious tendency for the children to differ with respect to age.

(Effects of working with older child) Category 7 (figure 9)(table 10)

School A

This table records that most children show increased need for orientation when paired with an older partner. Once again this is a rather natural result.

School B

In this school there are individual differences which are highly consistent. In other words some children seek more orientation [both for puzzle and construction tasks] when paired with an older partner while others seek less orientation. These individual differences hold for both the 6 with 8 year and the 8 with 10 year age groups.

School C

In this school the majority of children show increased need for orientation when paired with an older partner but there is less consistency here than in School B. In other words a child may request more orientation in one task and less in another.

(Effects of working with younger child) Category 7 (figure 9)(table 10)

School A

The differences for this school are inconclusive although there is slight evidence of a task difference in the 15 with 13 year age group. In this group orientation requests increase in the construction task and decrease in the puzzles task but this difference might be due entirely to chance factors.

TABLE 11

Summary of direction of change in category 10 frequencies when working with older or younger children compared with a like aged child.

	With an older child					With a younger child			
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	3	3	1	-	13yr 11yr	1	1	3	1
13yr 15yr	1	1	2	2	15yr 13yr	2	2	1	-
Totals	4	4	3	2		3	3	4	1
School B					School B				
6yr 8yr	5	4	1	2	8yr 6yr	1	1	4	2
8yr 10yr	3	3	3	2	10yr 8yr	2	2	4	2
Totals	8	7	4	4		3	3	8	4
School C					School C				
6yr 8yr	1	1	4	3	8yr 6yr	4	-	2	5
8yr 10yr	-	2	2	4	10yr 8yr	2	2	4	2
Totals	1	3	6	7		6	2	6	7

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

School B

The results for this school are rather confused as differences are small and inconsistent throughout the table. Apparently the effect of being paired with a younger partner (as opposed to being paired with a partner of the same age) is wholly unpredictable.

School C

As with School B the effect of pairing a child with a younger partner is somewhat variable. Once again it looks as if the need for orientation fluctuates randomly under the different pairings conditions.

(Effect of working with older child) Category 10 (figure 10)(table 11)

School A

In this case there is a very slight tendency to disagree more with older children.

School B

In this figure it can be seen that there are more positive differences than negative differences, and this suggests that here the negative emotional reactions tend to increase if a child is paired with an older partner.

School C

In this table the tendency noticed in School B children is reversed. In other words, there are more negative differences, and it looks as if these children sometimes showed less disagreement with older partners.

(Effects of working with younger child) Category 10 (figure 10)
(table 11)

School A

In this school there are no noticeable differences with respect to the age factor.

TABLE 12

Summary of direction of change in category 11 frequencies when working with older or younger children compared with a like aged child.

With an older child					With a younger child				
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	3	2	1	1	13yr 11yr	-	-	3	1
13yr 15yr	3	1	-	1	15yr 13yr	4	3	-	1
Totals	6	3	1	2		4	3	3	2
School B					School B				
6yr 8yr	3	4	3	2	8yr 6yr	4	3	1	3
8yr 10yr	3	4	2	2	10yr 8yr	3	4	2	1
Totals	6	8	5	4		7	7	3	4
School C					School C				
6yr 8yr	3	4	3	1	8yr 6yr	2	2	2	1
8yr 10yr	4	1	2	3	10yr 8yr	2	4	4	2
Totals	7	5	5	4		4	6	6	3

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

School B

In this table the trend of the previous figure for School B (Category 10 older) is reversed. In other words, there are more negative differences than positive differences which suggests that when a child is paired with a younger child its negative emotional reactions decrease. And again, this is to be expected as the presence of the younger child is not really threatening. Presumably there are individual differences again, but it seems that the presence of the younger or older child has quite a strong emotional effect with certain children. It should be remembered that this agrees with comments already made concerning the effects of different age pairings on scores in the negative emotional areas.

School C.

As with School B, these children produced more negative differences than positive differences, and it seems reasonable to suppose that they show less disagreement with younger children.

(Effects of working with older child) Category 11 (figure 11)(Table 12)

School A

In this case individual differences are not obvious, but there is a slight tendency for anxiety scores to increase. In other words, there is a slight tendency for these children to show more nervousness when paired with an older partner.

School B

As with Category 10, there is a slight tendency for scores to increase when a child is paired with an older child. The point to notice about Category 11 is that it concerns the showing of tension, and it rather looks as if some children inhibit hostility and signs of tension much better than others when paired with an older child. (Alternatively, or additionally,

inhibition might be due to the presence of the experimenter).

School C

In the case of these children, the overall tendencies and individual differences are not quite so marked, but there is still some slight evidence that different patterns of hostility were being exhibited by different children.

(Effects of working with younger child) Category 11 (figure 11) (table 12)

School A

There are no significant differences here, although there is a little evidence that the 13 with 11 grouping gives a slightly different pattern of hostility from the 15 with 13 grouping. Presumably, it would be interesting to collect data on individual differences between children having the same M.A. but a different C.A. A reasonable expectation might be that the personality traits would differ rather considerably with increasing C.A. but constant M.A.

School B

The results in this table are not entirely consistent with the results for Category 10. In figure 11 children tend to show more signs of tension when paired with a younger child. The opposite result might have been expected. One possible explanation is that a child might be nervous when paired with a younger child in case the younger child should be able to solve the problem first. This means that a child will be partly pleased and partly worried by a younger partner. On the one hand, he can assert his authority over the younger child. On the other hand, he must do his best to make sure the younger child does not beat him or show him up. In other words, it is important for prestige that the younger child should not show himself to be more clever.

TABLE 13

Summary of direction of change in category 12 frequencies when working with older or younger children compared with a like aged child.

With an older child					With a younger child				
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	1	3	3	-	13yr 11yr	2	2	2	2
13yr 15yr	1	2	2	1	15yr 13yr	1	2	3	1
Totals	2	5	5	1		3	4	5	3
School B					School B				
6yr 8yr	3	1	2	3	8yr 6yr	4	4	2	2
8yr 10yr	2	3	4	3	10yr 8yr	2	3	3	3
Totals	5	4	6	6		6	7	5	5
School C					School C				
6yr 8yr	-	4	6	2	8yr 6yr	4	5	2	1
8yr 10yr	1	-	5	6	10yr 8yr	3	5	3	1
Totals	1	4	11	8		7	10	5	2

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

It is worth noting that Category 11 is not entirely successful, because it includes (1) asking for help, and (2) looking worried, nervous etc. Strictly speaking, a child might well look worried because he does not want to ask help from a younger child. In the results above, the high category scores are due to nervous gestures and not to asking for help from younger children.

School C

In this case there are apparently no significant differences with respect to age.

(Effects of working with (1) older child / (2) younger child) Category 12 (figure 12) (table 13)

School A

In this case there are no significant differences in respect to age. It is observed that when the children are paired with younger partners, individual differences can still be noted, but these are much smaller and less significant.

School B

In the figure it can be seen that some children react to a partner of a different age by increasing hostility, whereas others decrease in hostility. Strictly speaking, the word "hostility" is too strong when applied to children in the kind of situation already described. It would be more appropriate to use the word "excitability" - a term which covers such acts as playfully kicking, pulling the tray away from each other, shouting, pushing, etc. Once again, it can be seen that there are fairly big individual differences in which the effects of a different age partner can sometimes produce much greater excitability and sometimes much less excitability. It can be noted that the results from Categories 10, 11 and 12 strongly support the general view that the effects of the different age

TABLE 14

Summary of direction of change in category C frequencies when working with older or younger children compared with a like aged child.

With an older child					With a younger child				
	Positive differences		Negative differences			Positive differences		Negative differences	
School A	puzzles	construc-tion	puzzles	construc-tion	School A	puzzles	construc-tion	puzzles	construc-tion
11yr 13yr	-	3	4	1	13yr 11yr	1	4	2	-
13yr 15yr	3	3	1	1	13yr 13yr	2	4	1	-
Totals	3	6	5	2		3	8	3	-
School B					School B				
6yr 8yr	3	3	2	2	8yr 6yr	6	6	-	-
8yr 10yr	2	2	4	3	10yr 8yr	-	4	6	1
Totals	5	5	6	5		6	10	6	1
School C					School C				
6yr 8yr	-	2	4	2	8yr 6yr	4	4	2	2
8yr 10yr	2	3	4	3	10yr 8yr	2	3	3	2
Totals	2	5	8	5		6	7	5	4

NOTE: Frequencies are for positive and negative, where values are zero frequencies are not given.

groupings are most clearly seen in the negative emotional area.

School C

As with School B, there are some striking individual differences resulting from different age pairings. Furthermore, these differences tend to be predominantly negative: there is a rather clear tendency to display antagonism when working with an older child. As with School B individual differences are rather pronounced and the changing patterns of antagonism appear very similar in both schools when children are paired with younger partners.

(Effects of working with (1) older child (2) younger child) Category C (figure 13) (table 14)

School A

In the case of School A children, there appears to be a slight tendency to concentrate more when working with a younger partner, especially on construction tasks.

An interesting possibility here is that construction tasks may have a greater appeal than puzzles to children who are comparatively backward. In this case, they would naturally try harder in construction tasks than in puzzles. In the case of children working with an older partner, there is still a slight tendency for children to concentrate more on construction tasks than on puzzles, but this tendency is not at all large.

School B

The results in the figure (older and younger) are rather difficult to interpret, but it seems as if there are differences due to age as well as differences due to type of partner. It is, therefore, worth discussing the results for each age group separately.

Children of 6 and 8 years old

In this age group there is a clear tendency for 8 year olds to concentrate more when working with a younger child than with a child of their own age. However, no clear tendencies emerge with respect to the 6 year olds, because some of the 6 year olds concentrate more with their own age group, while others concentrate more when put with 8 year olds.

Children of 8 and 10 years old

In this age group there is a slight tendency for 10 year olds to concentrate less when placed with the younger partners. Similarly, there is a slight tendency for 8 year olds to concentrate less when placed with 10 year olds. If these results are significant they might be due to the fact that the 6 year olds, 8 year olds and 10 year olds are in some respects at different stages of intellectual development, despite the fact that they appear to have the same mental age. In the actual experiment Raven's Matrices Test was used on all children and although it has a good reputation, it does not directly test the kinds of stages of development discussed, for instance, by Piaget. Presumably, it is not controversial to say that there may be considerable differences between persons having the same mental age but different chronological age. In consequence, the 10 year olds might, for instance, have thought that there was no need to concentrate extra hard in the presence of 8 year olds. On the other hand, the 8 year olds might well have thought that they should try to do their very best against the exceptionally intelligent 6 year olds.

School C

As before, the results for the C categories are not very easy to interpret, but there is some evidence for thinking that children tend to concentrate more when paired with a younger child and less when paired with an older child. Once again, it might be suggested that an older child tries hard in order not to be out-smarted by a younger partner. Alternatively, a young child may feel that he can leave the responsibility of solving the problem to the older child. Presumably, it depends on the level of aspiration of the child involved. In a future experiment it would be interesting to introduce various systems of reward (either to the individual children or to the group) in order to see how patterns of concentration, co-operation, competition etc. are affected.

General Conclusions as to Age Effects

In most of the category scores age effects were not consistent in the three schools; it would seem either that there are no consistent age effects measureable by this method, or such effects as exist are masked by other influences peculiar to particular schools. There is, however, a fairly consistent tendency for children to concentrate more when paired with a younger child.

V CONCLUSIONS

It seems likely that the previous discussion might not have appealed to anyone who is "intolerant of ambiguity". Naturally, it would be much more convenient to have clear-cut tidy results, but these are not always obtainable - especially in exploratory experiments in the field of social behaviour.

In order to see what has been achieved it is now appropriate to draw together and summarise the various strands of the discussion, and to show how these are related to the subject matter of the thesis.

As stated in the introduction the original and basic objective of the investigation was to compare the problem-solving behaviour of children working on their own with the problem-solving behaviour of the same children working [on similar tasks] with partners of different ages. In designing this research it was arranged to use Bales system of Interaction Process Analysis, but as the Bales system has apparently never been applied to the interaction of young children, the enquiry also served to test the range of validity of Bales system.

The main claim made for the present study is that it throws considerable doubt on the usefulness of Bales' theoretical system, for investigating young children. Apparently, the categories fail to balance each other in the way that Bales suggests; there is "overlapping" between categories (and no procedure for dealing with this), while the scores on certain categories (e.g., 5, 8 and 9) were disproportionately low. On the other hand, the scores on certain other categories (e.g., category 11) were too gross - in the sense that they prevented the possibility of making potentially useful distinctions (e.g., between asking for help and looking worried). As an

increasing number of people are now using Bales' system, it is important to have shown up these weaknesses in a specific experimental situation.

Because of this unexpected snag, which the experiment was not designed to meet, together with other difficulties (in the way of uncontrolled variables) which are well-known to social researchers, certain difficulties of interpretation arise. However, it is fairly clear that if a child is made to work (willingly or otherwise) in partnership with a child of a different age, the main effect is to bring about rather sharp changes in what Bales describes as the "negative emotional area". These changes do not all follow the same pattern. As might be expected, there are sharp individual differences - some children showing more antagonism and others less. However, there is some evidence that, on balance, it is more disturbing for a child to be paired with an <u>older</u> partner than with a younger - although even this tendency appears to vary for different ages. In probing the data in various ways and from various points of view, the present writer has considered a number of (post hoc) hypotheses that might profitably be tested in a follow-up enquiry to resolve certain inconsistencies in the collected data. These include the possibility that the more backward children tend to be more united [or cohesive] as a result of their backwardness. Another possibility is that the attitudes of children toward the different age partner alters with increasing age. In particular there is evidence that all children regard younger partners as a handicap in problem-solving situations, whereas younger children regard a still younger partner as an advantage because it gives them an opportunity to exhibit their superiority or to show off. Of course, there is an element of anxiety involved here because of the possibility that a younger partner

might solve the problem first. To overcome this difficulty there appears to be a tendency for less orientations and suggestions to be made to younger partners. Yet another possibility worth pursuing is that task involvement is higher in construction tasks than in the puzzles for certain children - especially the more backward ones. It should be noted that because of the limited scope of the present enquiry these possibilities cannot be confirmed with any degree of certainty and it would be misleading to suggest otherwise.

Despite the fact that the data are somewhat inconclusive, certain general remarks can be made about the main theme of the enquiry concerning the different patterns of co-operation observed under the different conditions used. The results here are rather surprising because the overall impression is that patterns of co-operation remain fairly constant throughout. In other words, helpful remarks or orientation, etc. occurred with all mental age groups and with both kinds of task. As already indicated, it was patterns of hostility rather than patterns of co-operation that changed most prominently. Of course, it must be remembered that the experimental situation was rather artificial in the sense that the children were probably on their best behaviour. Furthermore, the results might well have been different if different material, problems, etc. had been used. In real life situations, it might well be the case that patterns of co-operation would change with different mental age groups. In other words, a bright child might refuse to co-operate with a duller child if he was allowed a free choice. This is a matter which deserves further investigation.

Whatever the results of future investigation it is at least fairly clear that no general laws are likely to be formulated concerning the problem-solving behaviour of children in small groups. Earlier experiments

in co-operative behaviour, discussed in the Historical Background seem to suggest rather uniform results. For instance there appears to be a widespread belief that a co-operative atmosphere is good for morale and leads to improvements of quality of work etc. However, the present experiment suggests that the situation is more complicated than this, especially with children. In particular the need to do well [associated with higher levels of aspiration] is likely to be frustrated in a co-operative atmosphere. This is a factor which appears to have been largely overlooked by previous researchers but comes out fairly clearly in the present study.

The possibility that different results might be obtained under more natural circumstances make it necessary to consider whether the present study can legitimately be described as a study in co-operative behaviour. For instance, the reader might want to claim that the investigation did not study co-operation in the usual sense of the word, but investigated an artificial situation in which two children were forced to work together whether they like it or not.

Whether or not this kind of situation should be allowed to count as "co-operation" depends largely on the way in which co-operation is defined. In the Historical Background the problem of definition was discussed in some detail and need not be repeated here. It is sufficient to say that co-operation has been conceptualized by various theorists in a variety of ways, e.g. in terms of group competition, pooled judgment, common goals, mutual helpfulness, etc. - and an attempt was made in the Historical Background to abstract the common elements of these approaches.

This is a standard procedure in psychology. For instance it is customary for animal psychologists to describe their maze experiments as

learning situation, whereas it might be more accurate to say that the experiment is a test of choice behaviour between two alternatives. In the same way some psychologists have used the word "attention" to cover such things as vividness of experience, postural set and consciousness, etc. Presumably psychologists are entitled to interpret concepts in any way that is scientifically useful, provided they do not abuse English too much. In the Historical Background the psychologists privilege of defining terms in his own way has been exercised in defining co-operation as the working together of two or more people. In this sense the present experiment can undoubtedly be regarded as a study of co-operation.

It is finally necessary to say something about the category of concentration which was superimposed on the Bales' system. This category was originally conceived as being entirely neutral and falling between Bales' categories 6 and 7, but an examination of the results strongly supports the view that concentration involves a combination of positive tasks involvements and positive emotional attitudes. In particular, children rated as concentrating tend to exhibit a kind of behaviour which Bales would probably assign to categories 2 and 4. In this sense concentration forms a higher level category and helps to make the data more meaningful. For instance, children who concentrate most on a task often show much less overt activity, and this is clearly different from the case in which children exhibit less overt behaviour because they are bored or day-dreaming. The addition of the concentration category obviously enables these cases to be distinguished and therefore forms a valuable adjunct to the Bales' system.

This enquiry has attempted to make a contribution to the understanding

of co-operative problem-solving in young children. Children of varying ages participated in the experiment and were required to solve problems a) on their own, and b) with a partner of the same age, and c) with a partner of a different age. The interaction processes were scored by means of Bales' system and a special concentration category was added in an effort to make the data more meaningful.

An important conclusion to be drawn from the enquiry is that Bales' system shows serious weaknesses when applied to young children. These have been elaborated in the main body of the discussion.

A further conclusion that emerges, despite the difficulties occasioned by the defects in Bales' system, is that patterns of hostility rather than patterns of co-operation tend to be most affected by the different pairing arrangements.

Throughout the main discussion considerable stress has been placed on individual differences among children. Contrary to the impression given by some early researches there is little sign that any general laws of co-operative behaviour can be formulated. Apparently some children prefer a co-operative atmosphere while others prefer to compete. Presumably personality and developmental factors are operating here. In order to arrive at a deeper understanding of the interaction processes involved it is apparently necessary to supplement Bales' system with additional categories at higher levels of abstraction. The possibility and desirability of introducing such categories appears to be well illustrated by the present writer's use of the concentration category.

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APPENDIX A

APPENDIX A

Bales' Frame of Reference

Bales' frame of references used in the construction of his categories which are relevant in the present study:

a) observer's point of view

b) actor and situation

c) problem-solving sequence

d) social structure of the group

Observer's point of view

The observer postulates his own position as that of a member of a group towards whom the actor's behaviour is directed. From this point of view he categorizes the significance of the actor's behaviour.

The observer's point of view implies that he is observing the mutual interaction of the behaviour of the actor and of the postulated group member. He puts himself in the position of the group member who is trying to identify himself with the position of the actor and to understand his feelings. Further, the observer tries to identify himself with the group member as the latter perceives the actor. The actor's behaviour is described as it is perceived by the group member as he is perceived by the observer.

This view of the observer's role raises the question as to how much he should allow his observations to be influenced by his prior knowledge of the individual personalities of the group members and of the culture of the group. The answer is that he should allow this to happen only to the extent that his knowledge is the same as that of the group member

from whose position throughout he must try to view the actor. In actual fact, in a group which is developing under observation, the observer and group members become acculturated to about the same extent.

Actor and Situation

The observer sees the personality of the observed individual as a complex of interacting parts. At any given moment an overt behaviour involves only a part of this complex: an action is the result of the interaction of only certain components of the personality. The author of the action, or in other words, the actor, is therefore not identical with the observed individual as a biological entity. A logical exclusion of this line of reasoning, however, would reduce the term "actor" to a complete abstraction. In fact, the term "actor" is used in a less abstract sense to distinguish the self involved in the action from the more extended self perceived by the actor.

From the standpoint of the actor the observer changes to a point of view in which the second person now in action is actor, and the first person, and his now past activities, become a part of the situation.

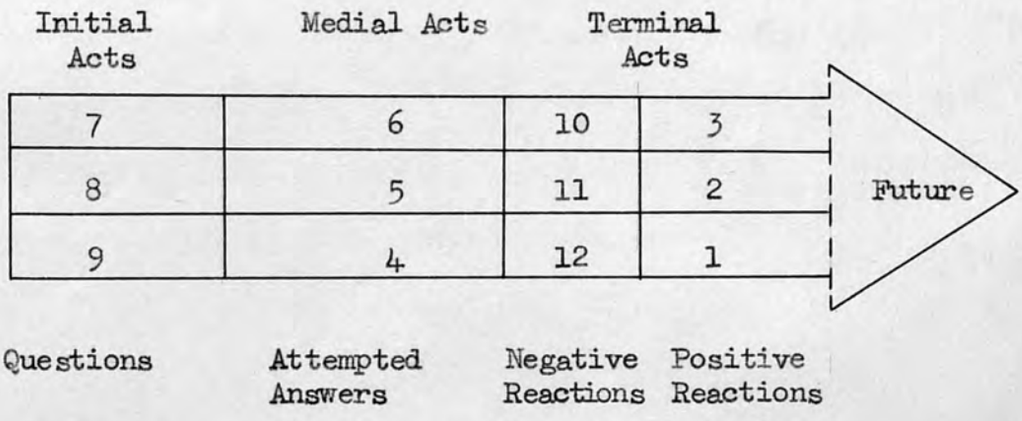
Again, actor and situation, as the observer uses the terms, are two poles of a conceptual framework which the observer uses to characterize certain aspects of each act as it comes along. The referents of these concepts change both as action proceeds with the same person acting, and also as the observer changes his point of view to a new person. In other words, for the observer, the act itself is the centre of attention; the actor or situation are descriptive aspects of the act.

The problem-solving sequence

Action can be located in terms of the subject (actor)-object (situation) polarity. But the process of action, which is a target objection within the framework of this polarity, can itself be differentiated internally so as to form a context within which a particular act takes place.

The process of action is complex and three aspects of this complexity may be considered. Firstly, it involves a time dimension. An act occurs, for instance, in a temporal scale in relation to what has gone before and what follows; it may also involve a state of feeling which may be distinct from a preceding, or a succeeding, stage of feeling. Secondly, an act occurs at a particular point in time and therefore involves a particular complexity at that point of time. This complexity can be conceived by the observer in terms of elements and aspects of the action process designated as cognitive (thinking), affective (feeling) and conative (intention). Obviously, every act involves some of these characteristics which we can abstract, and it seems clear that individuals differ in the degree of emphasis they place in them. Lastly, the process of action involves interaction between the actor and other persons and therefore involves certain parts of their personalities and their emotional states at the moment when it occurs. Interaction is then a shared or joint social activity. Communication between the individuals is indispensable, and does exist as a result of interaction. Any failure as to thinking, feeling or intention felt by one or all the members of the group.

Here is a diagram which presents this problem solving sequence. Notice that at any moment it is suggested here that this is the way interaction always goes, rather a way in which and when these specific conditions (shared integrity of the process is affected) our observations are based:



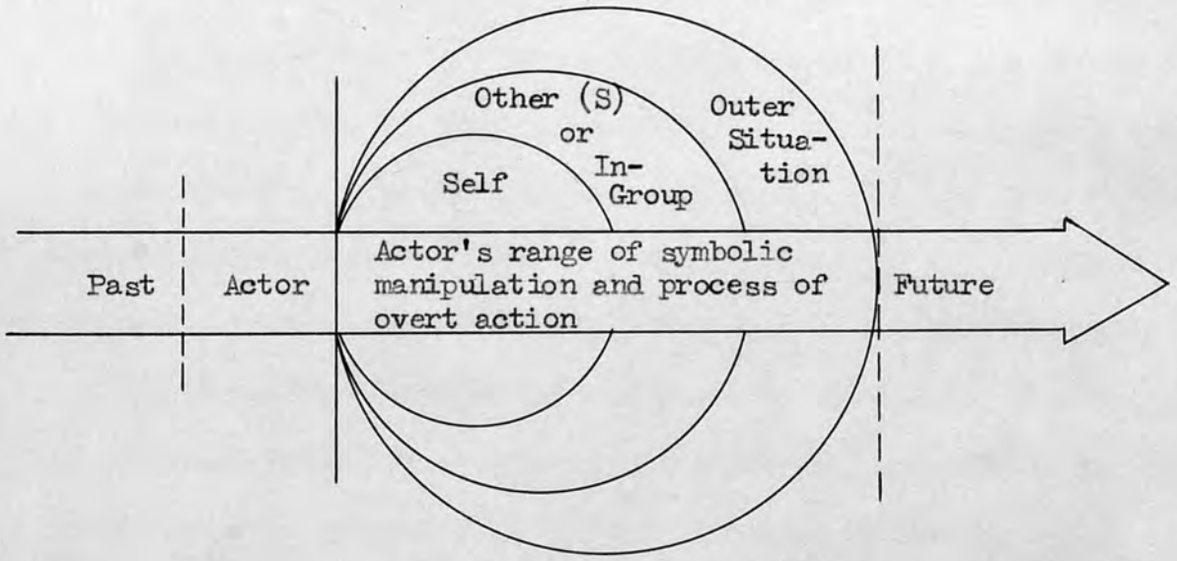
P.D. The numbers are the numbers of the twelve categories which we will discuss very soon.

Social Structure of the Group

Within the actor-situation's frame one point of focus (or area which the actor tries to change or which is changing him so that he is giving primary importance to it) was that composed of the other (S) or in group. His area can also be further differentiated internally.

The actions of other individuals are important to the problems of tension reduction of a given individual since they may aid or interfere with or modify his own activity. It is to the advantage of every individual in a group to stabilize the potential activity of others towards himself. The culture of groups is to be understood as a system of solutions to the problem of interaction.

We further note that although the culture of a group is the result of interaction everything relating to a particular act constitutes, with reference to that act, the situation. The actor and situation are distinct. The actor is treated as a final point but the situation can be further broken down into the inner situation and the outer situation. The inner situation includes the self and the other (S) subjectively considered by the actor. The outer situation includes the other (S) present and all physical objects and relationships not considered subjectively. If represented in a diagram it will perhaps show these relations-actor-situation - more clearly, like this:



Notice that the role of the observer is not located in the diagram. The reason is quite simple - it is hard to state his "generalized position" as viewed by the actor. The diagram in itself explains the situation. The inner circle represents the self, the middle circle represents the other or in group, and the outer circle represents the outer situation. According, then, to the actor, the time dimension reads from past, through present and then to future. The past and

future activities can be reached by the actor through symbolic manipulation, which in itself is the present activity. Thus, the actor perceives, evaluates or changes the targets of the situation through the process of action itself which includes both symbolic activity and overt action. The process of action is represented as cutting through past, present and future situations, passing from subject to object poles.

Of significant importance to mention here is the fact that actor and situation do not have stable referents through a time span of any length. At times, the observer can point to their concrete referents only for a given momentary act which he chooses to isolate for analysis. In the next act of the same person, another aspect may be uppermost in the personality, in a sense of steering action, and what the observer a moment ago regarded as actor, now becomes object or a part of the self. A second source of such instability consists in the fact that when another person speaks or acts in relation to the first, the referents of actor and situation reverse as the observer constitutes an impairement in the integrity of the total process of action. Three acts are suggested to guide the observer in such conditions.

No.1 - initial act - this is usually a signal of need or difficulty and arises in the form of a question, disagreement or repetition. It is noticed by the observer only.

No.2 - medial act - this is an attempt to answer the initial act and arises in the form of an answer to that question. It is noticed by the participants as well as by the observer.

No.3 - terminal act - this is usually a signal of approval or disapproval. (It might be positive or negative), toward the solution of the problem. Again, it is observed by the participant and observer.

Once it arises it forms a part of the framework within which further interaction takes place. Similarly, although the individual personality is shaped by interaction within the group, it becomes an effective factor in the framework within which further changes occur. Therefore, in order to understand interaction within a particular group, it is necessary to understand the structure and special features of the individuals who comprise the group. Here, we are primarily concerned with those aspects of the personalities of the individuals which involve them as participants in interaction within the group. Many of the qualitative distinctions we feel in the observation of social interaction depend upon the nature of their social relationship with temporal sequence. In this way we can see that the same kind of concrete behaviour might be called "rewarding the other", "congratulating the other" and "admiring the other" if the position of the actor is assumed to be higher, equal and lower respectively. Similarly, a concrete behaviour might be called "submission" if it follows an aggressive attack by the other, or "agreement" if it follows a tentative proposal and so on and so on.

No.1 There are four sections in the chart labelled A, B, C and D. Section C constitutes a group of activities which can be characterized very generally as Questions. Section B constitutes a group of attempted Answers. Section A contains several varieties of Positive Reactions,

and Section D contains a similar group of Negative Reactions. Using this conception, Bales hypothesizes that the interaction process consists of questions, followed by attempted answers, followed by either negative or positive reactions.

No.2 Regard the middle area of the system, Sections B and C as constituting an area of Task Problems, while the terminal sections, A and D, constitute an area of Social-Emotional Problems.

Bales hypothesizes that the interaction process would be described as one of alternating emphasis on the two types of problems. When attention is given to the task, strains are created in the social and emotional relations of the members of the group, and attention then turns to the solution of these problems. So long as the group devotes its activity simply to social-emotional activity, however, the task is not getting done, and attention would be expected to turn again to the task area.

No.3 Regard the problems in the task area as primarily adaptive - instrumental in significance, while the problems in the social-emotional area are primarily integrative-expressive in significance.

Bales hypothesizes that the necessity of adaptation to the outer situation leads to instrumentally oriented activity, which in turn tends to create strains in the existing integration of the group. When these strains grow acute enough, activity turns to the expression of emotional tension and the reintegration of the group. While reintegration is being achieved, however, the demands of adaptation wait, and activity eventually turns again to the adaptive-instrumental task.

No.4 Regard each pair of categories as concerned with a particular aspect or phase of the complete problem-solving process. It will be noticed that there is a symmetrical relation between the top half and the bottom half of the list of categories, with the middle line between categories 6 and 7 taken as the starting point. To illustrate, categories 7 and 6 are concerned with the functional problem of communication. The next pair, 8 and 5, are concerned with problems of evaluation, and following in order, categories 9 and 4 with problems of control, 10 and 3 with problems of decision, 11 and 2 with problems of tension reduction and 12 and 1 are concerned with problems of reintegration. The successful transition through any particular phase may be regarded as one of the functional prerequisites to the maintenance of the interaction system in a kind of equilibrium.

Bales in conceiving the problem-solving process according to this model, then, assumes that there is a general tendency toward equilibrium; that is, a more or less regular turnover of phases back to a steady state. In order to maintain or regain the moving steady state, problems of communication must be solved as they arise, and so must also problems of evaluation, control, decision, tension reduction and reintegration.

Now let us present here Bales' system of categories used in observation and their major relations. Remember that the chart represents the position of the twelve categories in the problem-solving sequence. And that the problem-solving sequence is visualized as a system of interaction distributed in time and between members with a general ten-

dency to move from a state in which a problem is recognized to a state in which the problem is solved. By doing this, we are assuming that certain social and psychological problems arise quite directly out of the relations of the members of the system to an outer situation.

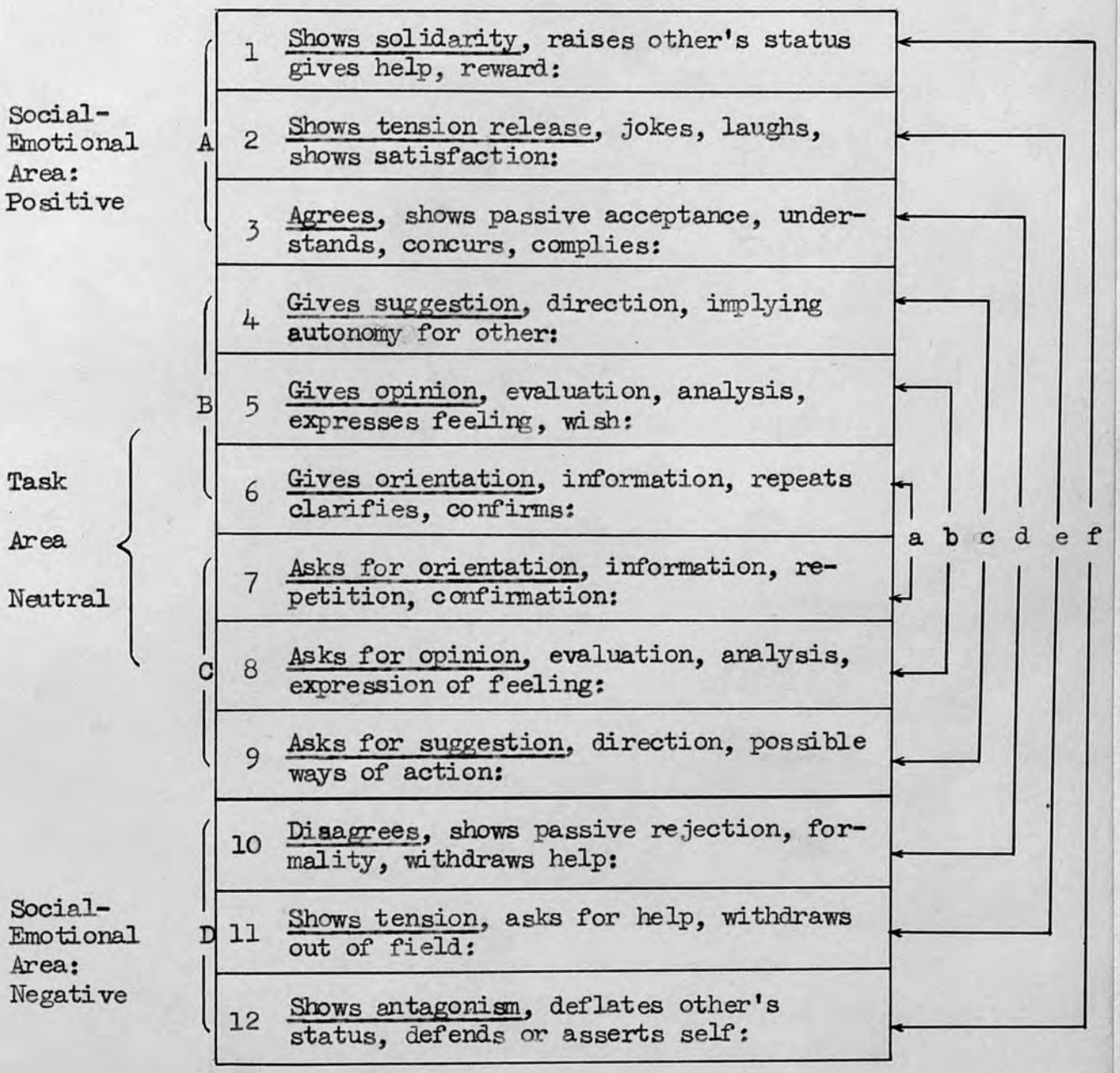
At the same time and quite briefly, we shall see different ways in which the problem-solving sequence process can be conceived according to Bales' interpretations.

In adapting Bales' categories to the research context of co-operative behaviour, enlargement of the neutral task area was done with the interposition of "concentration". There is no doubt in the writer's mind that all the categories have emotional roots, but this specific category, although theoretically it would appear to have the least emotional content as the word in itself describes it - is mainly concerned with the concentration of the task area weighed or loaded by intense emotional strength.

In choosing concentration as the starting category it was felt that this could be best placed between the six upper and six lower categories, by this means separating the categories so that a clearer picture could be obtained between the positive and negative categories. However, their interaction and perhaps equilibriating effects or tendencies arising between them seems to lead to higher concentration. (This, of course, is roughly speaking according to an eye-view of some statistical results).

Perhaps, and again this is a kind of hypothesis, the co-operation between the upper and lower categories may lead to higher concentration, but the attendant antagonism may have the ultimate effect of producing negative results in concentration. This suggests that the emotional reactions may overcome the intellectual capacities or reactions of children of certain age groups. In such cases the equilibrium attained would be of a negative nature as balance would have been reached at a lower concentration level.

The system of categories used in observation and their major relations



KEY

a. Problems of Communication
b. Problems of Evaluation
c. Problems of Control
d. Problems of Decision
e. Problems of Tension Reduction
f. Problems of Reintegration

A. Positive Reactions
B. Attempted Answers
C. Questions
D. Negative Reactions

The twelve major categories in terms of which the scoring is done is shown here:

Social-Emotional Area: Positive	A	1	Shows solidarity, raises other's status, gives help, reward:
		2	Shows tension release, jokes, laughs, shows satisfaction:
		3	Agrees, shows passive acceptance, understands, concurs, complies:
Task Area:	B	4	Gives suggestion, direction, implying autonomy for other:
		5	Gives opinion, evaluation, analysis, expresses feeling, wish:
		6	Gives orientation, information, repeats, clarifies, confirms
Neutral			Concentration
	C	7	Asks for orientation, information, repetition, confirmation:
		8	Asks for opinion, evaluation, analysis, expression of feeling:
		9	Asks for suggestion, direction, possible ways of action:
Social-Emotional Area: Negative	D	10	Disagrees, shows passive rejection, formality, withdraws help:
		11	Shows tension, asks for help, withdraws out of field:
		12	Shows antagonism, deflates other's status, defends or asserts self.

The following definitions conform to the standard definitions given by Bales, but with modifications as to the behaviour actions which decide where to classify a given empirical act in the present system of categories.

1. Shows solidarity, raises other's status, gives help, reward: (Friendly behaviour does not mean friendliness but is defined as the occurrence of one of the following):

It includes such acts as: moved closer to partner who had tray; talked softly - examiner could not hear. Imitated partner - in running the model etc. Smiled at each other. Gave help in order to overcome the other person's difficulty. Exclaimed "Lovely!" Talked in low voice - examiner could hear comments "That's right".

2. Shows tension release, jokes, laughs, shows satisfaction: includes acts such as: whistled, talked and smiled, laughed. Talked a lot. Sang while working.

3. Agrees, shows passive acceptance, understands, concurs, complies: Includes such acts as: moved blocks at the same time, watched. Both moved from opposite sides of tray. Glanced at the examiner. Looked at each other. Glanced at partner. Looked at the examiner. Agreed. Obeyed. Commented "That's right". "I know". "I got it". "O.K."

4. Gives suggestion, direction implying autonomy for other: repeated and talked, moved. Took wheel base first. Ran wheels on table. Moved more. Put extra blocks into wooden box. Directed. Pointed to blocks to be moved. Helped to complete task directly rather than helped the other person. Asked questions such as: "Is it finished?". "Where

are we?" "This must go there".

5. Gives opinion, evaluation, analysis, expresses feeling, wish: [This is the most abstract category. It is mostly based on inference. On the other hand, it is quite sure that most of its behaviour is noted in Categories 6, 12 and 11. I want to be as objective as possible].

6. Gives orientation, information, repeats, clarifies, confirms: Talked every step. Reported finished. Started tasks. Finished tasks. Gave information. Anticipated each move. Rearranged.

7. Asks for orientation, information, repetition, confirmation: Watched tray with diagram. Asked questions in relation to task such as: "Are all the blocks necessary to construct the church?" "Where are the wheels?" "Where is the roof?" "What is that for?" Looked at the picture, glanced at the picture. Looked intently at the picture. Asked for information as if "Does it have to go there?" Glanced at tape recorder. Glanced at stop watch.

8. Asks for opinion, evaluation, analysis, expression of feeling: Asked other person "Finished?" "Something is wrong?"

9. Asks for suggestion, direction, possible ways of action. Asked questions of examiner as "Have we finished?"

10. Disagrees, shows passive rejection formality, withholds help: Moved less. Watched with crossed arms. Disarranged blocks. Rested both arms on the table. Rested hand on the back of the chair. Reclined head on his hand. Reclined elbow on table. Rested head on right hand. Rested hand on table. Shook head. Made useful gestures. Said "Look,

at the picture." Frowned. Looked restless. Disagreed as saying "No, no."

11. Shows tension, asks for help, withdraws out of field: Dropped blocks on the floor. Rubbed wheels around mouth. Found difficulty in sliding blocks. Moved blocks listlessly. Found blocks stiff. Tapped fingers on the table. Rubbed hands. Rarely talked. Imitated. Distracted. Pulled at his hair. Scratched his head. Pouted with the lips, scratched nose, ear, face, chin, neck. Looked serious. Grimaced. Looked anxious. Murmured. Bit his fingers. Stuck out tongue. Bit tongue. Bit thumbnail. Took a deep breath. Looked confused. Sucked thumb. Remarked "Oh Lord." Put right hand around mouth.

12. Shows antagonism, deflates other's status, defends or asserts self:

Held diagram and placed by his side. Pushed tray to his side. Took tray away from partner. Pinched partner's fingers while moving. Drew tray closer to him. Did all the moves. Worked on his lap. Objected in telling what to do. Paid no attention to what the other said. Pulled hands of partner away. Disapproved. Commented "Give me that." "Let us fix the front, forget the back". "Please, move your precious things!" Disliked moves done by partner. Shouted. Said "Shut up."

(This category is self-explanatory, it is a combined category of intimidating and nuisance behaviour.)

Concentration on Task

Worked and committed same errors. Stood up while working. Remained standing. Worked with both hands. Worked with one hand. Held

tray with right hand or left hand or with both. Moved blocks in succession. Moved blocks slowly. Moved blocks equally, faster. Appeared to be thinking. Pulled tray closer to him. Attentive. Worked quickly. Knocked on blocks to make them move.

APPENDIX B

APPENDIX B

Details of the three schools where the Experimental work was carried out.

	District
School A	Good locality - on a beautiful hill. In the playgrounds the pupils play tennis, soccer, rugby, cricket etc. There is an open air theatre. Physically, houses in that area are well kept - they look clean and well ventilated - big buildings divided into flats. Seemingly quiet residential atmosphere. Many children travel quite long distances, by bus, train, bicycle and foot. (When the school was opened, pupils from other local schools were admitted).
School B	Heavily populated industrial and dirty area. No gardens. Children used a local park twice a week for school organized sports - athletics and football. Small cemented spaces beside each building (school) are considered as playgrounds. Home conditions are varied. Mostly pre-war L.C.C. flats or old small houses without gardens and limited facilities in the way of hot water, baths etc. The district is one where over-crowding is common and the general appearance of the buildings dilapidated.
School C	Poor locality - immediately round the corner. Few gardens and children play at times in the street. Two nearest playgrounds are across the main line railway - children rarely used them because of the distance from their home and the fact that parents cannot supervise them so easily. Catchment area is made up of a network of side streets with small cottage-like dwellings. Some older and larger houses are let into flats. Overcrowding seems to be not uncommon in these houses. In general poor housing facilities are observed from outside.

Appendix B (Continued)

	Occupation of Parents	Nationality of Parents	School Building
School A	In general working class. Some professionals - dentist; teachers. Others are office workers. Most of them labourers: bus-drivers, shop assistants, coalmen etc.	Mainly British Few Irish One Swedish.	Opened September 1957 New building. Modern architecture - beautiful design - glass windows round.
School B	Mainly working class. One or two professionals - engineers, teachers. Mostly unskilled labourers: few skilled technicians.	Few, if any, British. Mainly Irish and Polish. Quite a number Italians. Two Spanish. Four French - North Africa.	Built July 1866 - Very old but solid. Church School.
School C	Mainly working class- at present three professional. Mostly unskilled labourers: Council workers, road menders.	Most English. Less than one dozen mixture: Polish-Irish.	Built 1880 - old but solid building, - wings have been added since. Used to be a Church School.

Appendix B (continued 3)

	Organisation of School	Discipline
School A	Secondary Comprehensive. Age range 11-18 years. Coefficient of intelligence 130-170 - the majority are of average ability with smaller fixed proportion of children in each year. Nearly 2,000 pupils - more boys than girls. Majority white - approximately 12 negroes. Pupils have school uniform - majority wear it - one or two don't bother. Pupils are serious.	Formal but liberal. Pupils moved freely. Great respect toward the Headmaster.
School B	Junior mixed and infants. Age range from 5-11 years. Coefficient of intelligence 140-70. At present 574 pupils - more or less same number of boys and girls. All white - no negoes. School uniform - many don't wear it.	Religious and friendly - congenial, respectful. Pupils free to see visitors and staff members. Great respect of Parish Priest and nuns. Pupils highly trained socially.
School C	Primary - nursery, infants and juniors. Age range from 3-11 years. Coefficient of intelligence 127-72. At present 300 pupils - approximately same number of boys and girls. Majority white - 4 coloured. School uniform - majority do not wear it.	Children respond more to controlled type of activity. Children friendly to Headmistress.

Appendix B (Continued 4)

	P.T.A.	Religion
School A	None as organized body. After three years one day was opened for parents to see school, chat with teachers. Rather co-operative parents, I was told.	Undenominational - assembly prayers - Church of England. 30 pupils catholics. Few Jewish. One Mahommedan.
School B	Well established. Good contact. Meetings held every term. Very co-operative parents - agree with whatever staff say.	Roman Catholic children go to church. Parents encourage them.
School C	Several attempts made to hold meetings - not held any more. Parents co-operative to Headmistress. Parents discuss problems - mostly personal-domestic - direct with Headmistress.	Prayers - Church of England Few children go regularly to church. Parents do not encourage them to go to any church.

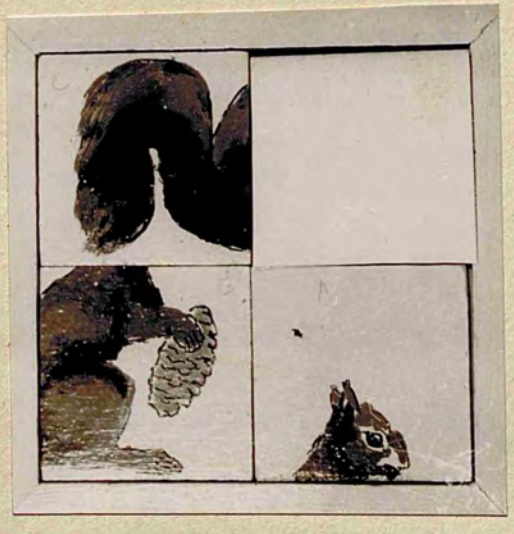
APPENDIX C

PLATE 3 SET A No. 1

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE

[a]

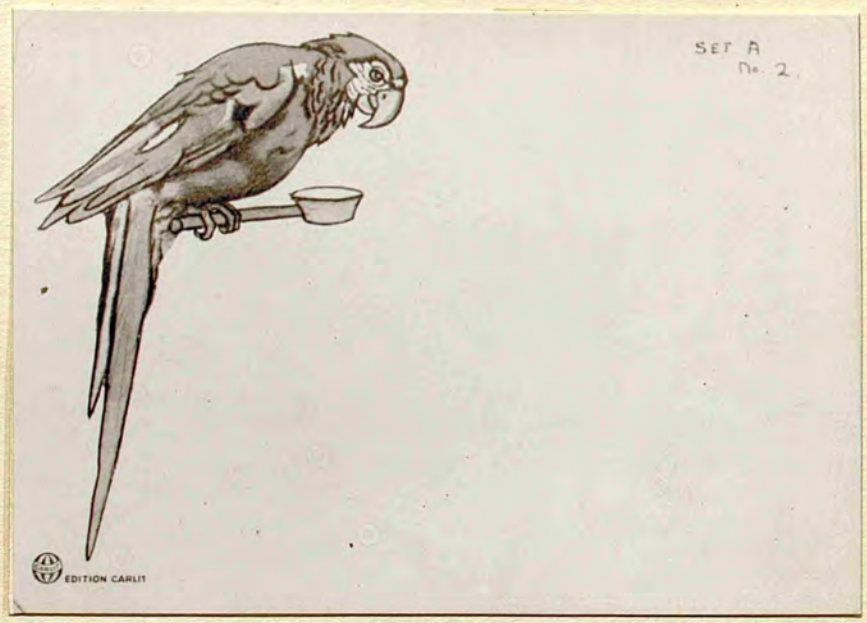


[b]

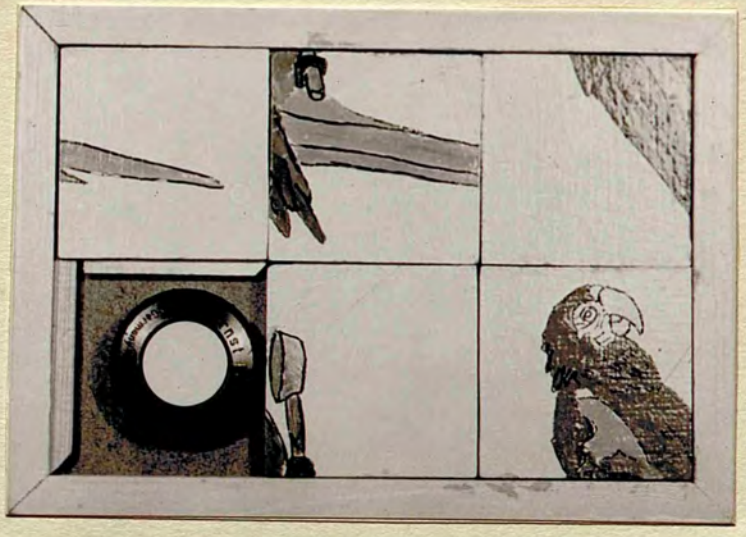
PLATE 4. SET A. No. 2.

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE



[a]



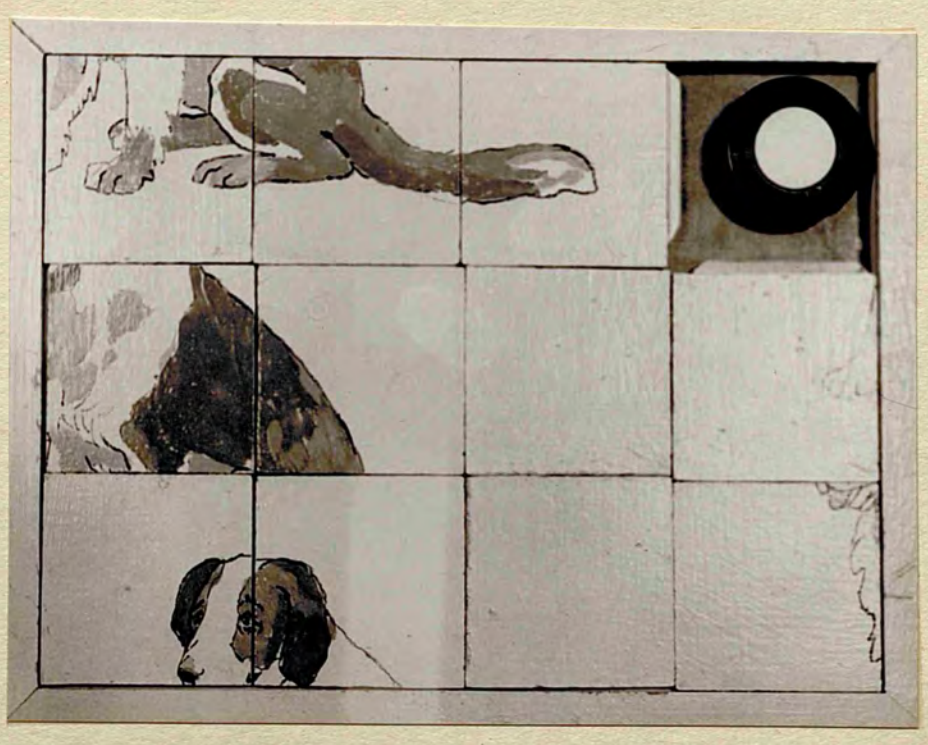
[b]

PLATE 5 SET A. No. 3

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE

[a]

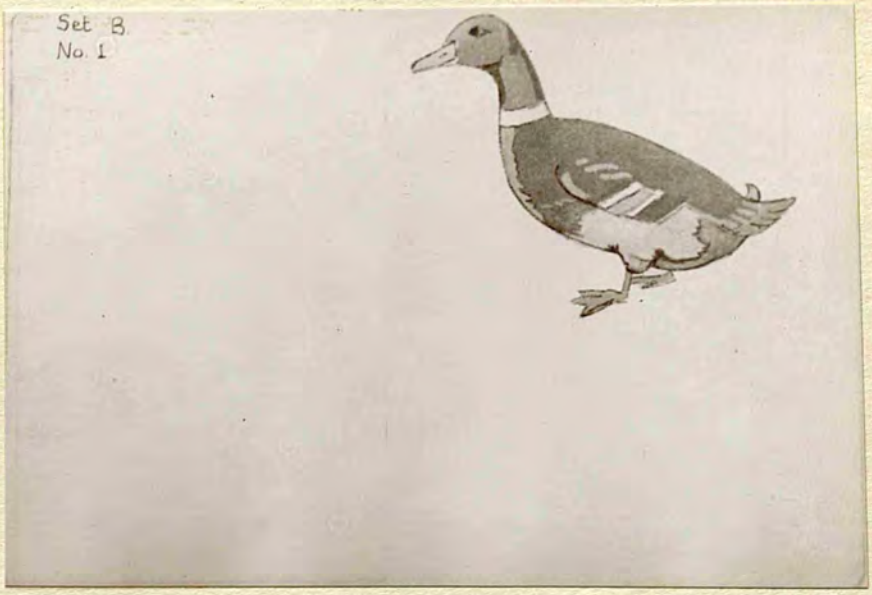


[b]

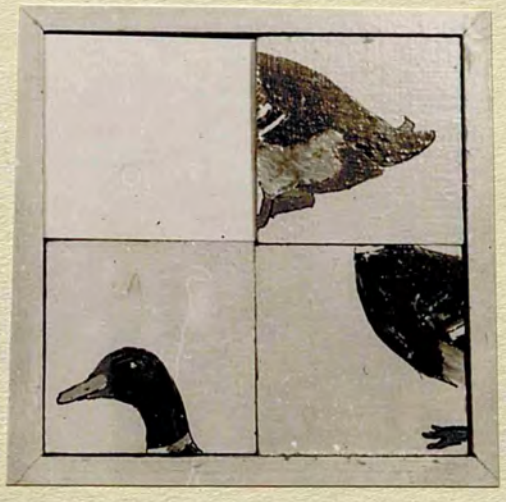
PLATE 6 SET B No. 1

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE



[a]



[b]

PLATE 7 SET B NO. 2

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE

[a]

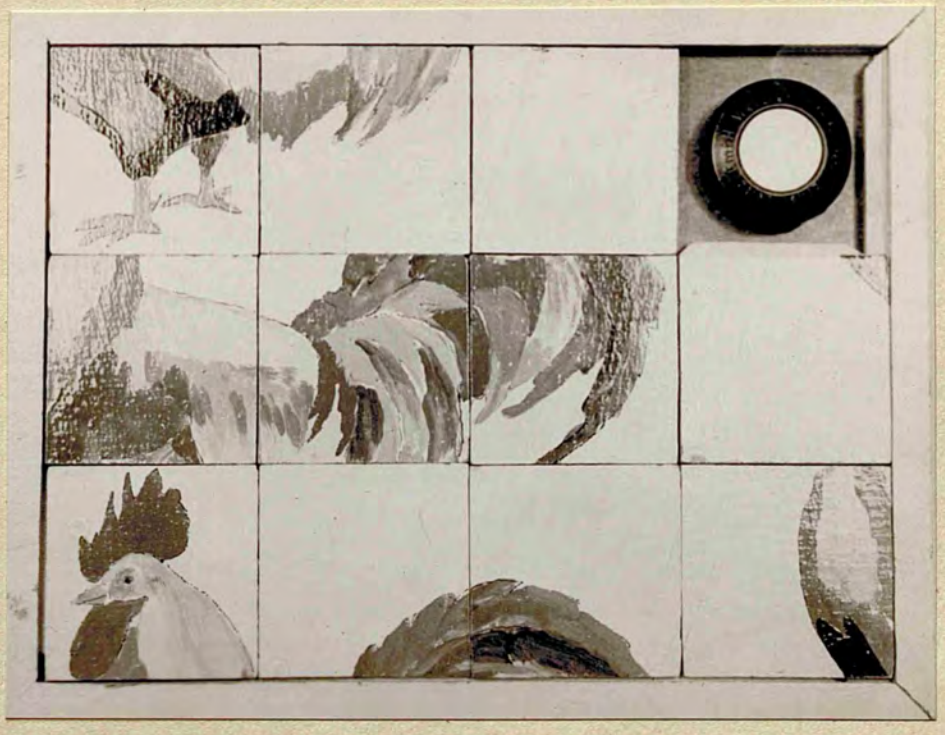
[b]

PLATE 8 SET B No.3

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE

[a]



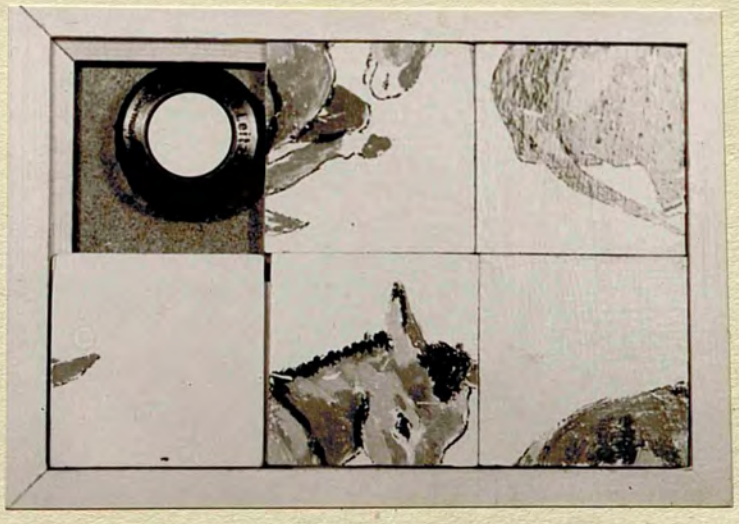
[b]

PLATE 9 SET C No. 2

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE

[a]

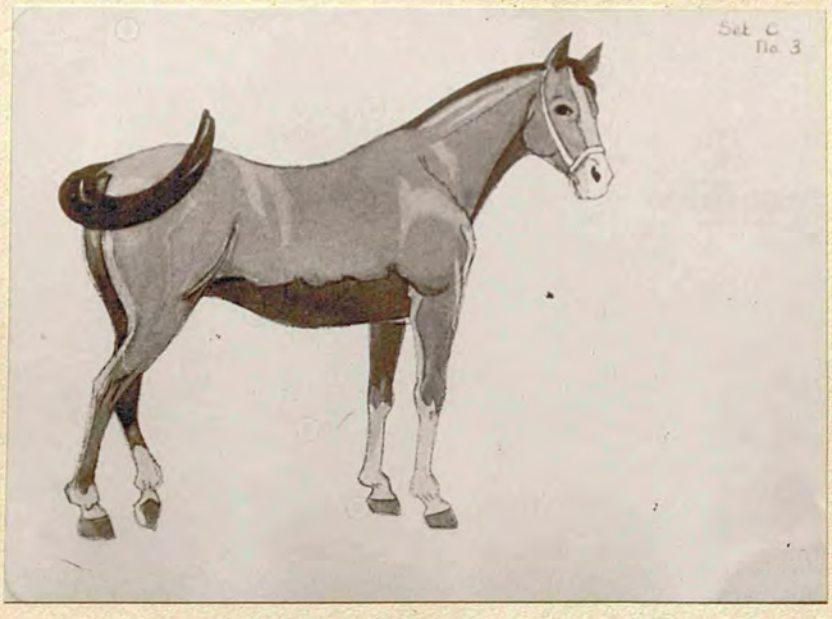


[b]

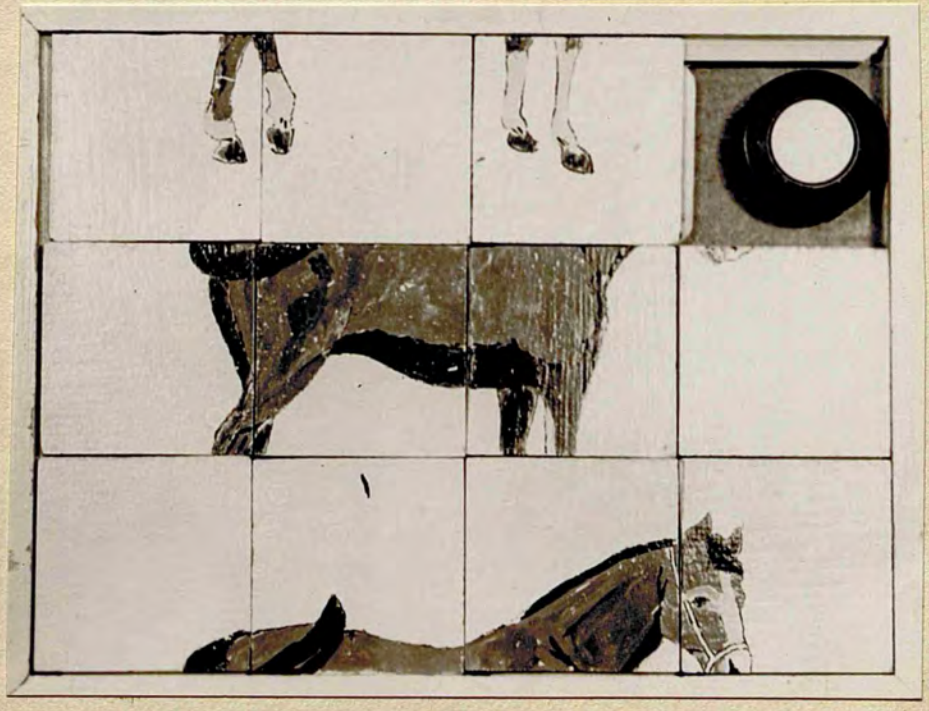
PLATE 10 SET C No. 3

THE TASK AS PRESENTED TO THE SUBJECT

[a] THE PICTURE [b] THE PUZZLE



[a]



[b]

APPENDIX D

APPENDIX D

Analysis of Variance Design

Two analyses of the scores obtained by the children were carried out. It was decided that the logarithms of the scores were approximately normally distributed; accordingly, logarithms were taken of all raw scores, and the analysis of variance technique was then used.

The aim of the first analysis was to discover whether the mean score changed with the age of the child. Each school was considered separately and a simple one-way analysis of variance was carried out to see whether there was a real difference between the mean scores of the three ages. The two degrees of freedom of the difference between ages were then further split into two single degrees of freedom. One of these was accounted for by the linear trend in the logarithm of the score and if this was significantly large, it showed a definite increase or decrease in score from the younger to the older children. The second degree of freedom related to the curvature in the scores, and if this was significantly large, it showed that the difference in the logarithm of the score was not the same between, say, the 6- and 8-year old children as between the 8- and 10-year old children. This analysis only used scores obtained when the children were partnered by another of the same age.

The main aim of the second analysis was to investigate whether the age of the partner had any effect on the child's score. Each

analysis dealt only with the difference between working with the same aged or older child, or with the difference between working with the same aged or younger child. If we consider only the difference between working with the same aged or an older child, from each school there were four children of each of two ages who had worked with both the same aged and with older children. The analysis was therefore carried out on the logarithms of 16 scores[1]. The 15 degrees of freedom were split into five independent parts:

(i) One degree of freedom for the difference between the two ages of children in the experiment. If this was significantly large, it showed a difference in mean score between the younger and older children.

(ii) One degree of freedom for the difference between the child's score when working with the same aged or older child. If this was significant, it showed that the child's score was affected by the age of its partner.

(iii) One degree of freedom for the interaction between the child's age and its partner's age. If this was significant, it showed that the younger children were affected differently (either more or less) by the age of the partner from the older child.

(iv) Six degrees of freedom for the difference between the four children of each age. If this was significantly large, it showed a real difference between the children.

(v) Six residual degrees of freedom. This was used as a basis for comparison for the significance of the first four parts.

Note 1. In schools B and C the number of pairs was larger and the pattern of analysis and distribution of the degrees of freedom was adjusted accordingly.

APPENDIX E

APPENDIX E

Complete time and social interaction scores for each child who took part in the experiment.

School A

11 years old

Time and IPA Scores

Child 1

A_2[1]	B_2[1]	C_2[1]
79	8	24
A_3	B_3	C_3
600U[2]	600U[2]	600U[2]
	8	2 Cat.1[3]
	4	4 Cat.4[3]
	3	1 Cat.6[3]
	8	4 Cat.10[3]
	3	7 Cat.11[3]
	4	1 Cat.12[3]
	16	10 Cat.C[3]

Child 2

A_2	B_2	C_2[1]
54	85	32.5
A_3	B_3	C_3[1]
370F	136F	284F[2]
	6	8 Cat.1[3]
	7	5 Cat.4[3]
	7	3 Cat.6[3]
	2	4 Cat.10[3]
	7	8 Cat.11[3]
	1	5 Cat.12[3]
	24	16 Cat.C[3]

Child 3

A_2	B_2	C_2[1]
132	85	23
A_3	B_3	C_3[1]
333F	136F	390F[2]
	5	7 Cat.1[3]
	4	3 Cat.4[3]
	2	4 Cat.6[3]
	2	3 Cat.10[3]
	5	0 Cat.11[3]
	5	3 Cat.12[3]
	13	9 Cat.C[3]

Child 4

A_2	B_2	C_2[1]
38	8	22
A_3	B_3	C_3[1]
600U	600U	600U[2]
	9	15 Cat.1[3]
	16	10 Cat.4[3]
	8	18 Cat.6[3]
	4	12 Cat.10[3]
	11	12 Cat.11[3]
	21	17 Cat.12[3]
	17	15 Cat.C[3]

Note 1 A set: individual, B set: with own age, C set: with 13 year old partner.

Note 2 U = Unfinished at time limit of 10 minutes. F = Finished.

Note 3 Scores for puzzles only are given here.

School A

13 years old
Time and IPA scores

Child 5				Child 6			
A_2	B_2	C_2 [1]		A_2	B_2	C_2 [1]	
60	85	39		15	9	57	
A_3	B_3	C_3 [1]		A_3	B_3	C_3 [1]	
392F	600U	530F [2]		600U	600U	600F [2]	
	6	4	Cat.1 [3]		6	8	Cat.1 [3]
	2	7	Cat.4 [3]		4	6	Cat.4 [3]
	5	3	Cat.6 [3]		3	4	Cat.6 [3]
	1	3	Cat.10 [3]		6	3	Cat.10 [3]
	4	4	Cat.11 [3]		7	9	Cat.11 [3]
	4	3	Cat.12 [3]		3	2	Cat.12 [3]
	12	14	Cat.C [3]		12	14	Cat.C [3]

Child 7				Child 8			
A_2	B_2	C_2 [1]		A_2	B_2	C_2 [1]	
12	8	60		9	25	180	
A_3	B_3	C_3 [1]		A_3	B_3	C_3 [1]	
335F	420F	600U [2]		600U	600U	600U [2]	
	11	8	Cat.1 [3]		15	3	Cat.1 [3]
	6	7	Cat.4 [3]		8	3	Cat.4 [3]
	2	2	Cat.6 [3]		5	3	Cat.6 [3]
	4	4	Cat.10 [3]		3	2	Cat.10 [3]
	4	13	Cat.11 [3]		6	7	Cat.11 [3]
	3	4	Cat.12 [3]		3	3	Cat.12 [3]
	15	17	Cat.C [3]		17	13	Cat.C [3]

Note 1 Set A: individual score, Set B: with partner of same age
Set C: with 15 year old partner.

Note 2 U = Unfinished at time limit of 10 minutes.
F = Finished

Note 3 Scores on puzzles only are given here.

School A

13 years old
Time and IPA Scores

Child 9			Child 10		
A_2	B_2	C_2 [1]	A_2	B_2	C_2 [1]
9	25	24	10	8	32.5
A_3	B_3	C_3 [1]	A_3	B_3	C_3 [1]
600U	600U	600U [2]	420F	420F	284F [2]
	14	4 Cat.1 [3]		10	7 Cat.1 [3]
	9	8 Cat.4 [3]		4	12 Cat.4 [3]
	4	3 Cat.6 [3]		6	3 Cat.6 [3]
	6	3 Cat.10 [3]		1	0 Cat.10 [3]
	9	8 Cat.11 [3]		3	1 Cat.11 [3]
	3	6 Cat.12 [3]		4	0 Cat.12 [3]
	20	10 Cat.C [3]		15	14 Cat.C [3]

Child 11			Child 12		
A_2	B_2	C_2 [1]	A_2	B_2	C_2 [1]
13	9	22	480	85	23
A_3	B_3	C_3 [1]	A_3	B_3	C_3 [1]
600U	600U	600U [2]	580F	600U	390F [2]
	6	13 Cat.1 [3]		5	7 Cat.1 [3]
	6	7 Cat.4 [3]		6	6 Cat.4 [3]
	4	1 Cat.6 [3]		3	1 Cat.6 [3]
	1	9 Cat.10 [3]		6	1 Cat.10 [3]
	13	13 Cat.11 [3]		4	1 Cat.11 [3]
	4	10 Cat.12 [3]		3	2 Cat.12 [3]
	10	14 Cat.C [3]		12	12 Cat.C [3]

Note 1 A set: individual, B set: with partner of same age,
C set: with 11 year old partner.

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

School A

15 years old
Time and IPA Scores

Child 13

A_2	B_2	C_2 [1]
7	45	180
A_3	B_3	C_3 [1]
600U	441F	600U [2]
	6	5 Cat.1 [3]
	6	8 Cat.4 [3]
	5	3 Cat.6 [3]
	2	4 Cat.10 [3]
	4	9 Cat.11 [3]
	1	0 Cat.12 [3]
	9	14 Cat.C [3]

Child 14

A_2	B_2	C_2 [1]
19	134	60
A_3	B_3	C_3 [1]
595F	600U	600U [2]
	7	7 Cat.1 [3]
	13	6 Cat.4 [3]
	2	1 Cat.6 [3]
	3	2 Cat.10 [3]
	4	9 Cat.11 [3]
	1	10 Cat.12 [3]
	12	7 Cat.C [3]

Child 15

A_2	B_2	C_2 [1]
33	134	39
A_3	B_3	C_3 [1]
222F	600U	530F [2]
	4	2 Cat.1 [3]
	1	5 Cat.4 [3]
	3	1 Cat.6 [3]
	2	2 Cat.10 [3]
	5	7 Cat.11 [3]
	4	1 Cat.12 [3]
	12	12 Cat.C [3]

Child 16

A_2	B_2	C_2 [1]
70	45	57
A_3	B_3	C_3 [1]
600U	441F	600F [2]
	7	6 Cat.1 [3]
	7	6 Cat.4 [3]
	3	2 Cat.6 [3]
	4	5 Cat.10 [3]
	2	8 Cat.11 [3]
	1	0 Cat.12 [3]
	8	11 Cat.C [3]

Note 1 Set A: individual, Set B: with partner of same age
Set C: with 13 years old partner.

Note 2 U = Unifnished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

School B

6 years old
Time and IPA Scores

Child 1

A_2	B_2	C_2[1]	
35	90	35	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	4	24	Cat.1[3]
	10	25	Cat.4[3]
	4	9	Cat.6[3]
	0	10	Cat.10[3]
	8	12	Cat.11[3]
	6	6	Cat.12[3]
	16	19	Cat.C[3]

Child 2

A_2	B_2	C_2[1]	
12	45	210	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	11	4	Cat.1[3]
	22	9	Cat.4[3]
	8	2	Cat.6[3]
	5	7	Cat.10[3]
	13	4	Cat.11[3]
	11	6	Cat.12[3]
	25	11	Cat.C[3]

Child 3

A_2	B_2	C_2[1]	
140	27	40	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	10	13	Cat.1[3]
	2	4	Cat.4[3]
	2	0	Cat.6[3]
	4	7	Cat.10[3]
	16	20	Cat.11[3]
	3	6	Cat.12[3]
	9	17	Cat.C[3]

Child 4

A_2	B_2	C_2[1]	
15	27	240	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	3	15	Cat.1[3]
	10	8	Cat.4[3]
	4	0	Cat.6[3]
	2	7	Cat.10[3]
	12	19	Cat.11[3]
	22	8	Cat.12[3]
	15	6	Cat.C[3]

Note 1 A set: individual, B set: with own age,
C set: with 8 year old partner.

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

Child 5

A_2	B_2	C_2[1]	
40	300	120	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	8	10	Cat.1[3]
	11	6	Cat.4[3]
	7	1	Cat.6[3]
	5	2	Cat.10[3]
	18	6	Cat.11[3]
	3	10	Cat.12[3]
	9	18	Cat.C[3]

Child 6

A_2	B_2	C_2[1]	
30	90	150	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	12	9	Cat.1[3]
	5	15	Cat.4[3]
	0	2	Cat.6[3]
	2	6	Cat.10[3]
	14	2	Cat.11[3]
	0	5	Cat.12[3]
	4	4	Cat.C[3]

Note 1 A set: individual, B set: with own age,
C set: with 8 year old partner.

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

School B

8 years old
Time and IPA Scores

Own (8)	Same (8)		Older Age (10)	
Child 7			**Child 8**	
A_2	B_2	C_2 [4]	A_2	B_2	C_2 [4]
12	20	24	90	15	180
A_3	B_3	C_3 [4]	A_3	B_3	C_3 [4]
600U	600U	600U [2]	600U	600U	600U [2]
	18	14 Cat.1 [3]		8	12 Cat.1 [3]
	12	3 Cat.4 [3]		7	20 Cat.4 [3]
	6	2 Cat.6 [3]		9	7 Cat.6 [3]
	6	3 Cat.10 [3]		11	8 Cat.10 [3]
	8	8 Cat.11 [3]		4	6 Cat.11 [3]
	10	2 Cat.12 [3]		25	21 Cat.12 [3]
	18	13 Cat.C [3]		14	6 Cat.C [3]
Child 9			**Child 10**	
A_2	B_2	C_2 [4]	A_2	B_2	C_2 [4]
50	14	420	34	45	60
A_3	B_3	C_3 [4]	A_3	B_3	C_3 [4]
600U	600U	600U [2]	600U	600U	600U [2]
	5	5 Cat.1 [3]		7	6 Cat.1 [3]
	12	13 Cat.4 [3]		7	6 Cat.4 [3]
	6	4 Cat.6 [3]		3	7 Cat.6 [3]
	15	13 Cat.10 [3]		4	6 Cat.10 [3]
	26	8 Cat.11 [3]		4	5 Cat.11 [3]
	38	46 Cat.12 [3]		21	6 Cat.12 [3]
	5	7 Cat.C [3]		14	8 Cat.C [3]

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

Note 4 A set: individual, B set: with own age,
C set: with 10 years old partner.

Child 11

A_2	B_2	C_2 [4]	
16	60	90	
A_3	B_3	C_3 [4]	
600U	600U	600U[2]	
	15	5	Cat.1[3]
	12	11	Cat.4[3]
	4	3	Cat.6[3]
	5	9	Cat.10[3]
	4	6	Cat.11[3]
	16	31	Cat.12[3]
	8	18	Cat.C[3]

Child 12

A_2	B_2	C_2 [4]	
60	240	210	
A_3	B_3	C_3 [4]	
600U	600U	600U[2]	
	10	7	Cat.1[3]
	9	16	Cat.4[3]
	7	7	Cat.6[3]
	4	11	Cat.10[3]
	16	12	Cat.11[3]
	16	15	Cat.12[3]
	15	10	Cat.C[3]

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

Note 4 A set: individual, B set: with own age,
C set: with 10 years old partner.

School B

8 years old
Time and IPA Scores

Own (8)	Same (8)		Younger age (6)		
Child 13			**Child 14**		
A_2	B_2	C_2 [1]	A_2	B_2	C_2 [1]
19	20	40	14	60	240
A_3	B_3	C_3 [1]	A_3	B_3	C_3 [1]
600U	600U	600U [2]	600U	600U	600U [2]
	9	8 Cat.1 [3]		14	14 Cat.1 [3]
	13	7 Cat.4 [3]		15	22 Cat.4 [3]
	6	4 Cat.6 [3]		3	8 Cat.6 [3]
	5	0 Cat.10 [3]		9	12 Cat.10 [3]
	12	17 Cat.11 [3]		13	18 Cat.11 [3]
	6	11 Cat.12 [3]		12	34 Cat.12 [3]
	12	20 Cat.C [3]		13	20 Cat.C [3]
Child 15			**Child 16**		
A_2	B_2	C_2 [1]	A_2	B_2	C_2 [1]
20	240	35	18	14	120
A_3	B_3	C_3 [1]	A_3	B_3	C_3 [1]
600U	600U	600U [2]	540F	600U	600U [2]
	14	19 Cat.1 [3]		12	12 Cat.1 [3]
	8	9 Cat.4 [3]		10	6 Cat.4 [3]
	6	6 Cat.6 [3]		4	5 Cat.6 [3]
	8	6 Cat.10 [3]		4	4 Cat.10 [3]
	8	8 Cat.11 [3]		20	7 Cat.11 [3]
	10	29 Cat.12 [3]		9	3 Cat.12 [3]
	9	16 Cat.C [3]		2	19 Cat.C [3]

Note 1 A set: individual, B.set: with own age,
C set: with 6 years old partner

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

Child 17

A_2	B_2	C_2 [1]	
59	15	210	
A_3	B_3	C_3 [1]	
600U	600U	600U [2]	
	5	1	Cat.1 [3]
	9	6	Cat.4 [3]
	9	5	Cat.6 [3]
	7	2	Cat.10 [3]
	4	9	Cat.11 [3]
	12	7	Cat.12 [3]
	12	15	Cat.C [3]

Child 18

A_2	B_2	C_2 [1]	
25	45	150	
A_3	B_3	C_3 [1]	
600U	600U	600U [2]	
	12	10	Cat.1 [3]
	14	18	Cat.4 [3]
	7	6	Cat.6 [3]
	7	5	Cat.10 [3]
	7	8	Cat.11 [3]
	7	28	Cat.12 [3]
	3	7	Cat.C [3]

Note 1 A set: individual, B set: with own age,
C set: with 6 years old partner.

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

School B

10 years old
Time and IPA Scores

Own (10)	Same (10)	Younger Age (8)

Child 19

A_2	B_2	C_2	^{4}
21	17	420	
A_3	B_3	C_3	^{4}
600U	600U	600U	^{2}
	5	8	Cat.1^3
	10	15	Cat.4^3
	4	3	Cat.6^3
	7	19	Cat.10^3
	13	37	Cat.11^3
	16	18	Cat.12^3
	14	3	Cat.C^3

Child 20

A_2	B_2	C_2	^{4}
480	50	180	
A_3	B_3	C_3	^{4}
420U	600U	600U	^{2}
gave up	12	12	Cat.1^3
	2	7	Cat.4^3
	2	2	Cat.6^3
	12	3	Cat.10^3
	17	4	Cat.11^3
	3	7	Cat.12^3
	9	6	Cat.C^3

Child 21

A_2	B_2	C_2	^{4}
240	180	24	
A_3	B_3	C_3	^{4}
600U	600U	600U	^{2}
	12	13	Cat.1^3
	11	2	Cat.4^3
	5	3	Cat.6^3
	0	1	Cat.10^3
	4	4	Cat.11^3
	43	6	Cat.12^3
	22	20	Cat.C^3

Child 22

A_2	B_2	C_2	^{4}
160	180	90	
A_3	B_3	C_3	^{4}
600U	600U	600U	^{2}
	23	8	Cat.1^3
	15	8	Cat.4^3
	6	4	Cat.6^3
	34	19	Cat.10^3
	22	14	Cat.11^3
	16	15	Cat.12^3
	9	4	Cat.C^3

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

Note 4 A set: individual, B set: with own age,
C set: with 8 years old partner.

Child 23

A_2	B_2	C_2 [4]
60	12	60
A_3	B_3	C_3 [4]
600U	600U	600U [2]
	9	8 Cat.1 [3]
	9	5 Cat.4 [3]
	8	2 Cat.6 [3]
	15	5 Cat.10 [3]
	7	9 Cat.11 [3]
	7	4 Cat.12 [3]
	17	4 Cat.C [3]

Child 24

A_2	B_2	C_2 [4]
52	50	210
A_3	B_3	C_3 [4]
600U	600U	600U [2]
	10	4 Cat.1 [3]
	13	2 Cat.4 [3]
	5	3 Cat.6 [3]
	4	3 Cat.10 [3]
	4	11 Cat.11 [3]
	12	12 Cat.12 [3]
	14	10 Cat.C [3]

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

Note 4 A set: individual, B set: with own age,
C set: with 8 years old partner.

School C

6 years old
Time and IPA Scores

Child 1				Child 2			
A_2	B_2	C_2[1]		A_2	B_2	C_2[1]	
360U gave up	15	26		30	15	8	
A_3	B_3	C_3[1]		A_3	B_3	C_3[1]	
420U gave up	600U	600U[2]		600U	600U	600U[2]	
	9	15	Cat.1[3]		11	4	Cat.1[3]
	4	4	Cat.4[3]		8	6	Cat.4[3]
	6	2	Cat.6[3]		3	1	Cat.6[3]
	10	6	Cat.10[3]		7	3	Cat.10[3]
	4	9	Cat.11[3]		8	3	Cat.11[3]
	43	18	Cat.12[3]		17	1	Cat.12[3]
	10	5	Cat.C[3]		10	6	Cat.C[3]

Child 3				Child 4			
A_2	B_2	C_2[1]		A_2	B_2	C_2[1]	
120	10	120		75	30	150	
A_3	B_3	C_3[1]		A_3	B_3	C_3[1]	
600U	600U	600U[2]		600U	240F	600U[2]	
	5	3	Cat.1[3]		5	4	Cat.1[3]
	8	1	Cat.4[3]		12	8	Cat.4[3]
	3	2	Cat.6[3]		11	3	Cat.6[3]
	6	6	Cat.10[3]		4	3	Cat.10[3]
	0	2	Cat.11[3]		7	1	Cat.11[3]
	11	0	Cat.12[3]		14	7	Cat.12[3]
	13	5	Cat.C[3]		11	11	Cat.C[3]

Note 1 A set: individual, B set: with own age
C set: with 8 year old partner

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here.

Child 5

A_2	B_2	C_2 [1]
35	15	600U
A_3	B_3	C_3 [1]
600U	600U	600U [2]
	12	4 Cat.1 [3]
	9	6 Cat.4 [3]
	6	1 Cat.6 [3]
	5	4 Cat.10 [3]
	7	9 Cat.11 [3]
	10	8 Cat.12 [3]
	8	8 Cat.C [3]

Child 6

A_2	B_2	C_2 [1]
600U	15	15
A_3	B_3	C_3 [1]
600U	600U	600U [2]
	4	1 Cat.1 [3]
	3	8 Cat.4 [3]
	4	3 Cat.6 [3]
	2	3 Cat.10 [3]
	9	0 Cat.11 [3]
	13	10 Cat.12 [3]
	19	7 Cat.C [3]

Note 1 A set: individual, B set: with own age,
C set: with 8 year old partner

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

School C

8 years old
Time and IPA Scores

Own (8) Same (8) Older Age (10)

Child 7

A_2	B_2	C_2 [4]
40	165	5
A_3	B_3	C_3 [4]
600U	540F	600U [2]
	1	6 Cat.1 [3]
	5	1 Cat.4 [3]
	4	1 Cat.6 [3]
	2	2 Cat.10 [3]
	1	3 Cat.11 [3]
	5	3 Cat.12 [3]
	17	3 Cat.C [3]

Child 8

A_2	B_2	C_2 [4]
19	15	15
A_3	B_3	C_3 [4]
600U	600U	600U [2]
	6	1 Cat.1 [3]
	13	3 Cat.4 [3]
	6	1 Cat.6 [3]
	6	5 Cat.10 [3]
	5	9 Cat.11 [3]
	27	0 Cat.12 [3]
	10	12 Cat.C [3]

Child 9

A_2	B_2	C_2 [4]
210	150	90
A_3	B_3	C_3 [4]
600U	600U	600U [2]
	3	7 Cat.1 [3]
	6	8 Cat.4 [3]
	4	4 Cat.6 [3]
	2	0 Cat.10 [3]
	2	0 Cat.11 [3]
	8	6 Cat.12 [3]
	16	7 Cat.C [3]

Child 10

A_2	B_2	C_2 [4]
60	150	8
A_3	B_3	C_3 [4]
540F	600U	600U [2]
	3	1 Cat.1 [3]
	0	3 Cat.4 [3]
	1	3 Cat.6 [3]
	2	2 Cat.10 [3]
	0	8 Cat.11 [3]
	14	0 Cat.12 [3]
	10	6 Cat.C [3]

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

Note 4 A set: individual, B set: with own age,
C set: with 10 year old partner

Child 11				Child 12			
A_2	B_2	C_2 [4]		A_2	B_2	C_2 [4]	
160	15	20		600U	165	180	
A_3	B_3	C_3 [4]		A_3	B_3	C_3 [4]	
600U	600U	600U[2]		600U	600U	600U[2]	
	3	6	Cat.1[3]		1	9	Cat.1[3]
	5	7	Cat.4[3]		3	9	Cat.4[3]
	3	0	Cat.6[3]		2	2	Cat.6[3]
	2	2	Cat.10[3]		2	2	Cat.10[3]
	8	1	Cat.11[3]		0	3	Cat.11[3]
	5	7	Cat.12[3]		5	4	Cat.12[3]
	4	6	Cat.C[3]		14	11	Cat.C[3]

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

Note 4 A set: individual, B set: with own age,
C set: with 10 year old partner.

School C

8 years old
Time and IPA Scores

Own (8) Same (8) Younger Age (6)

Child 13

A_2	B_2	C_2[1]	
600U	16	26	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	5	12	Cat.1[3]
	6	8	Cat.4[3]
	6	5	Cat.6[3]
	2	3	Cat.10[3]
	3	9	Cat.11[3]
	2	3	Cat.12[3]
	10	19	Cat.C[3]

Child 14

A_2	B_2	C_2[1]	
19	150	8	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	5	4	Cat.1[3]
	7	10	Cat.4[3]
	3	3	Cat.6[3]
	4	3	Cat.10[3]
	3	0	Cat.11[3]
	3	6	Cat.12[3]
	10	9	Cat.C

Child 15

A_2	B_2	C_2[1]	
100	32	120	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	6	3	Cat.1[3]
	5	2	Cat.4[3]
	3	3	Cat.6[3]
	5	0	Cat.10[3]
	2	2	Cat.11[3]
	6	0	Cat.12[3]
	5	7	Cat.C[3]

Child 16

A_2	B_2	C_2[1]	
90	32	150	
A_3	B_3	C_3[1]	
600U	600U	600U[2]	
	3	1	Cat.1[3]
	7	6	Cat.4[3]
	4	3	Cat.6[3]
	0	3	Cat.10[3]
	3	1	Cat.11[3]
	4	13	Cat.12[3]
	7	10	Cat.C[3]

Note 1 A set: individual, B set: with own age,
C set: with 6 year old partner

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

Child 17

A_2	B_2	C_2 [1]
330	150	600U
A_3	B_3	C_3 [1]
600U	600U	600U[2]
	4	6 Cat.1[3]
	7	9 Cat.4[3]
	4	4 Cat.6[3]
	4	7 Cat.10[3]
	2	6 Cat.11[3]
	23	15 Cat.12[3]
	15	11 Cat.C[3]

Child 18

A_2	B_2	C_2 [1]
25	16	15
A_3	B_3	C_3 [1]
600U	600U	600U[2]
	8	2 Cat.1[3]
	7	8 Cat.4[3]
	2	1 Cat.6[3]
	1	3 Cat.10[3]
	2	2 Cat.11[3]
	2	14 Cat.12[3]
	4	8 Cat.C[3]

Note 1 A set: individual, B set: with same age,
C set: with 6 year old partner

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

School C

10 years old
Time and IPA Scores

Own (10) Same (10) Younger Age (8)

Child 19

A_2	B_2	C_2	4
15	6	90	
A_3	B_3	C_3	4
600U	600U	600U	2
	4	17	Cat.1 3
	5	4	Cat.4 3
	4	4	Cat.6 3
	2	9	Cat.10 3
	4	7	Cat.11 3
	10	25	Cat.12 3
	19	10	Cat.C 3

Child 20

A_2	B_2	C_2	4
360	19	5	
A_3	B_3	C_3	4
600U	600U	600U	2
	4	7	Cat.1 3
	10	10	Cat.4 3
	5	4	Cat.6 3
	3	0	Cat.10 3
	7	2	Cat.11 3
	6	5	Cat.12 3
	11	8	Cat.C 3

Child 21

A_2	B_2	C_2	4
360	10	15	
A_3	B_3	C_3	4
600U	600U	600U	2
	4	6	Cat.1 3
	9	13	Cat.4 3
	4	4	Cat.6 3
	5	3	Cat.10 3
	10	5	Cat.11 3
	15	12	Cat.12 3
	7	17	Cat.C 3

Child 22

A_2	B_2	C_2	4
240	10	20	
A_3	B_3	C_3	4
600U	600U	600U	2
	1	6	Cat.1 3
	11	8	Cat.4 3
	3	7	Cat.6 3
	3	5	Cat.10 3
	7	1	Cat.11 3
	4	21	Cat.12 3
	7	7	Cat.C 3

Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

Note 4 A set: individual, B set: with own age,
C set:.with 8 year old partner.

Child 23

A_2	B_2	C_2 [4]
50	19	180
A_3	B_3	C_3 [4]
600U	600U	600U [2]
	5	7 Cat.1 [3]
	3	10 Cat.4 [3]
	0	4 Cat.6 [3]
	9	6 Cat.10 [3]
	10	5 Cat.11 [3]
	6	38 Cat.12 [3]
	5	8 Cat.C [3]

Child 24

A_2	B_2	C_2 [4]
8	6	8
A_3	B_3	C_3 [4]
600U	600U	600U [2]
	4	1 Cat.1 [3]
	5	1 Cat.4 [3]
	1	0 Cat.6 [3]
	4	2 Cat.10 [3]
	3	4 Cat.11 [3]
	15	9 Cat.12 [3]
	14	8 Cat.C [3]

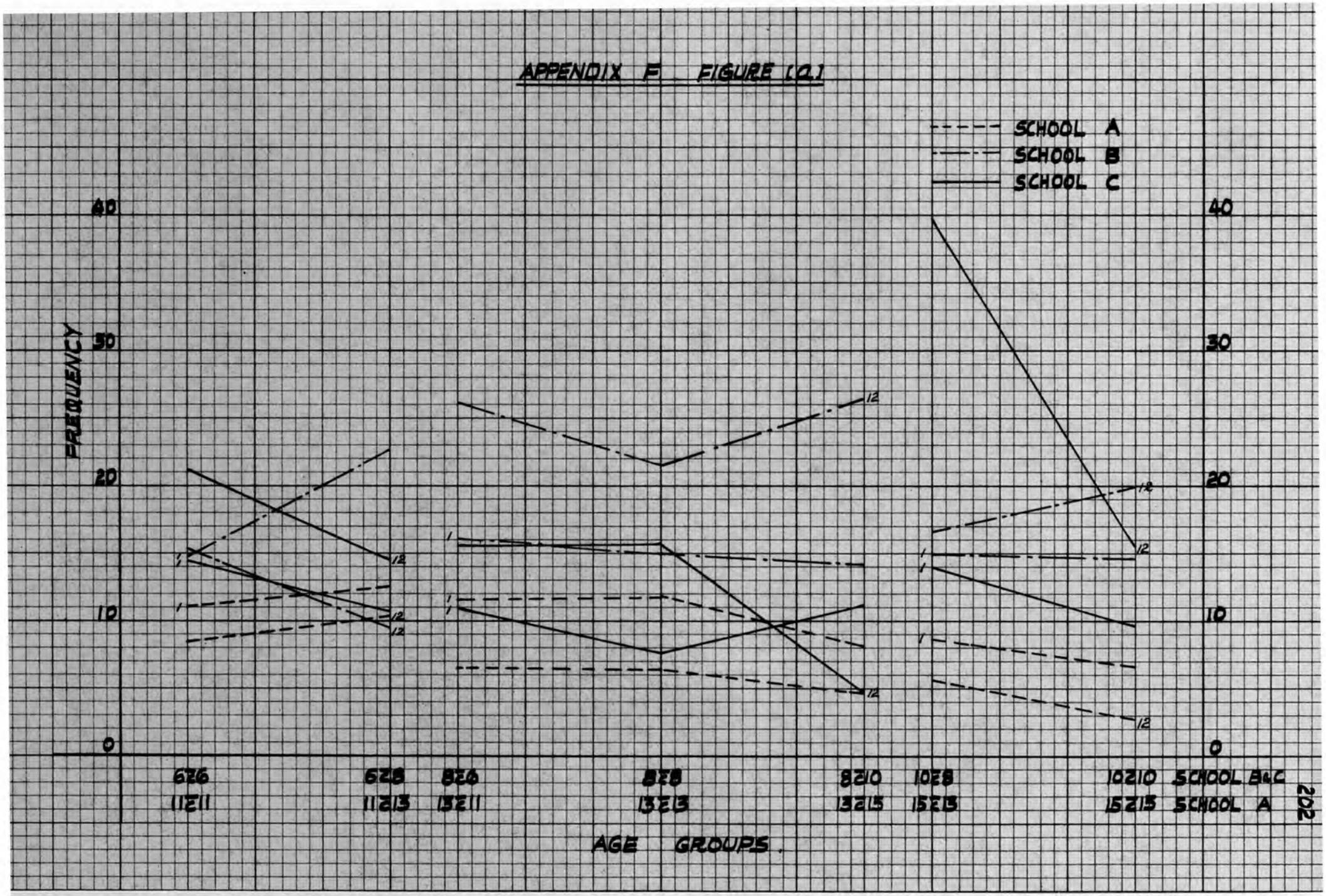
Note 2 U = Unfinished at time limit of 10 minutes
F = Finished

Note 3 Scores for puzzles only are given here

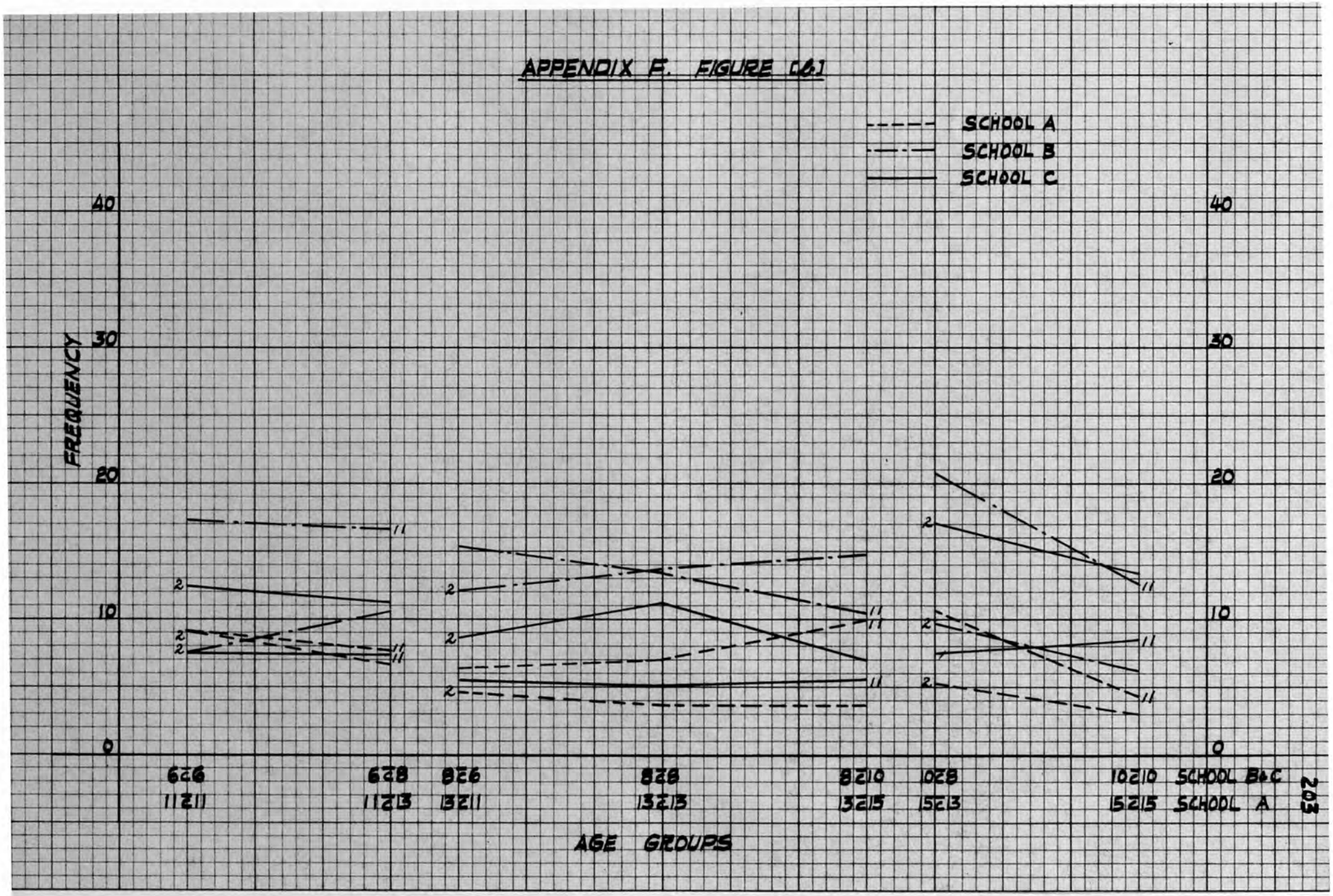
Note 4 A set: individual, B set: with own age,
C set: with 8 year old partner

APPENDIX F

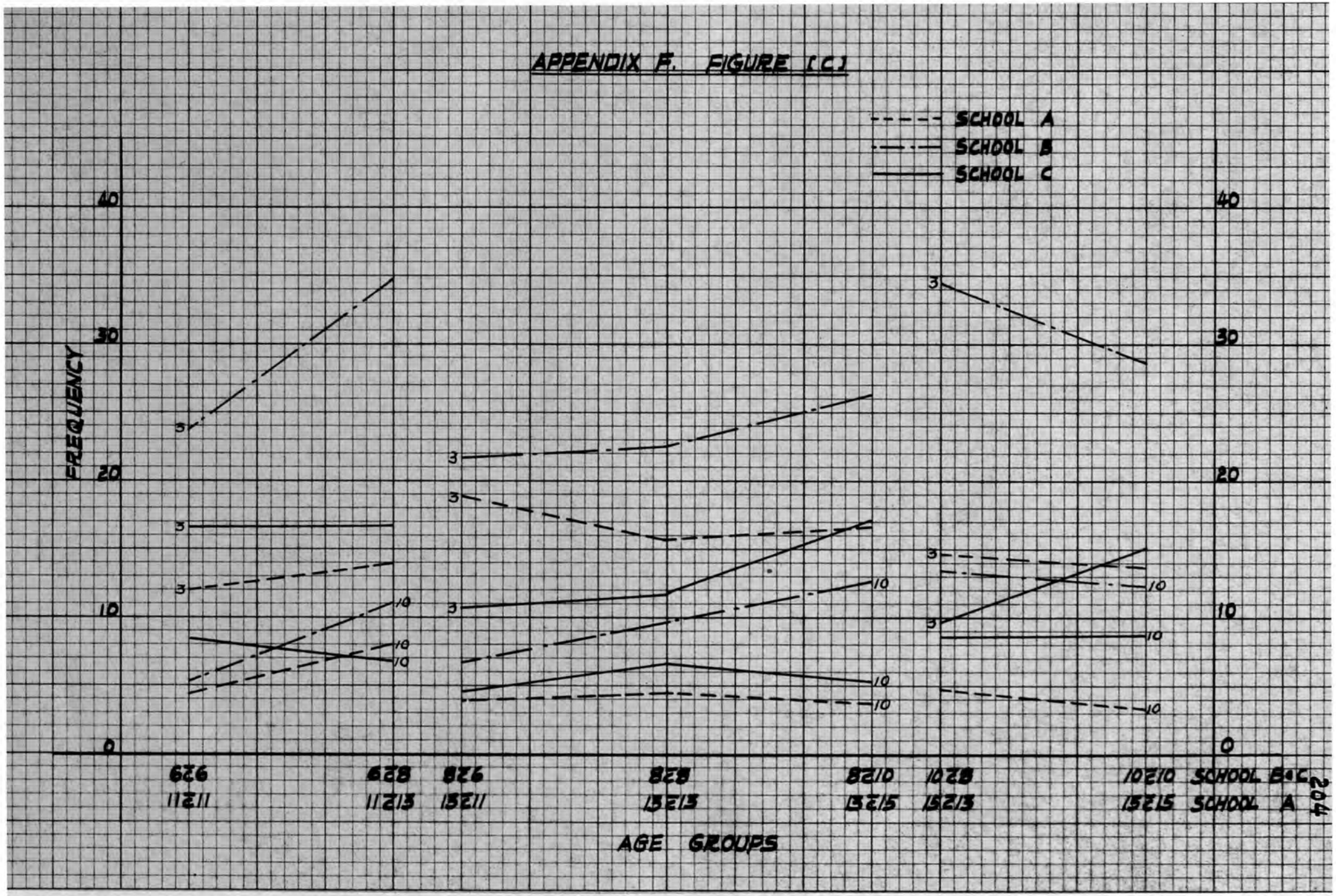
APPENDIX F FIGURE [Q.]



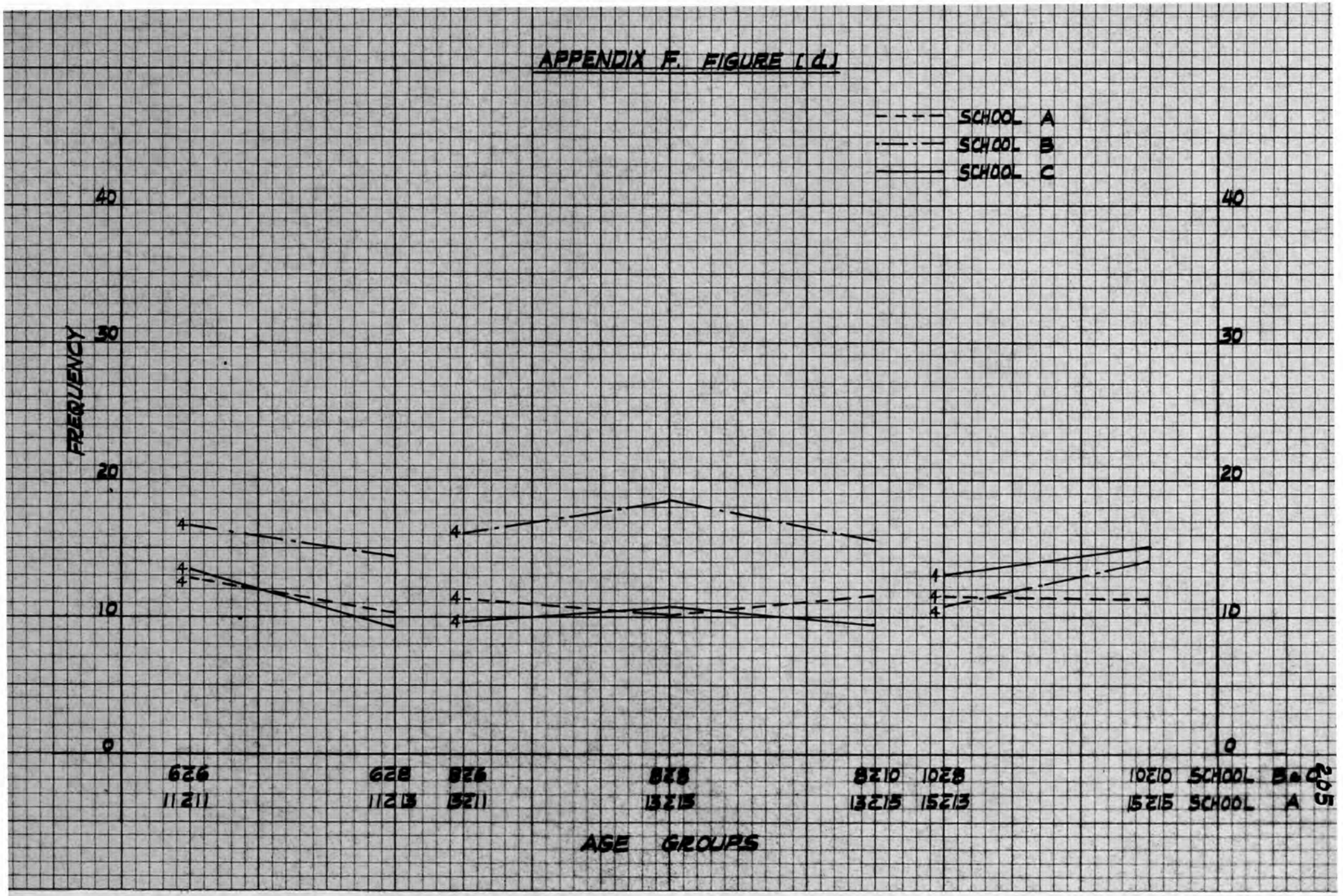
APPENDIX F. FIGURE [61]



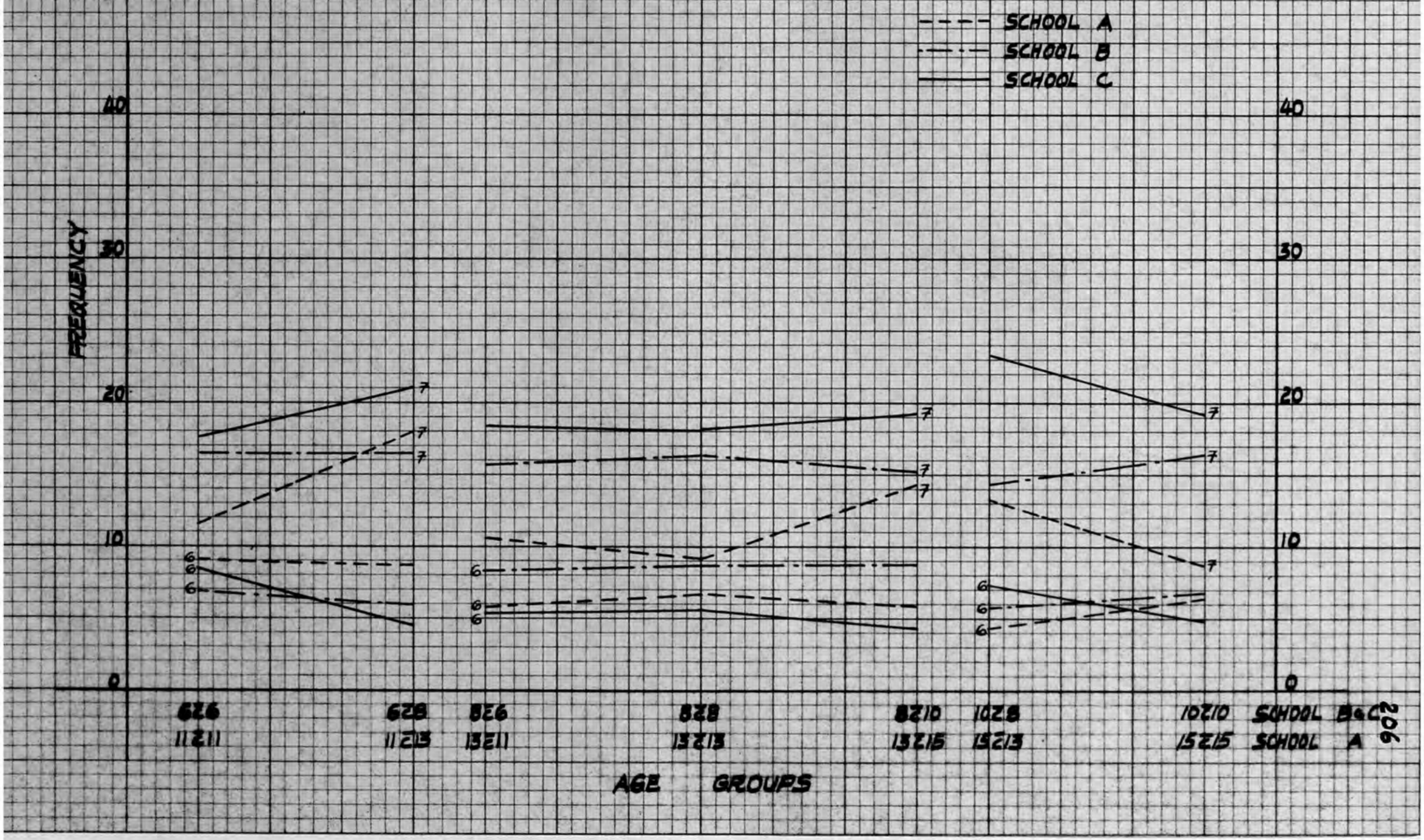
APPENDIX F. FIGURE (C)



APPENDIX F. FIGURE [d.]



APPENDIX F. FIGURE (B)



APPENDIX F. FIGURE [f]