AN INVESTIGATION INTO THE RELATIVE MERITS
OF ORAL AND WRITTEN TRANSMISSION OF
INFORMATION AND THEIR IMPLICATION
FOR THE CLASSROOM.

A Thesis Presented To The University
of Canterbury.

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By
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Chapter 1.

Overall Impressions of Communication.

In everyday life, of the great mass of communications that take place over any period, the great majority consist of oral messages from an individual or a group in homes, streets, offices and public gatherings of all types. In addition, there is the growing quantity of written language that is added to day by day and becomes more necessary in the greater and ever-growing cities and nations. From the personal letter to newspapers and historical documents, daily life is increasingly dependent upon visual reception of written language. In this study, communication is used in a broad sense as Shannon and Weaver\(^1\) define it. Hence it includes all forms of language, gesture and any other factors that transmit information. From this multitude of communication situations various features and difficulties become apparent.

The first and most obvious, is the great number of languages and dialects that have arisen as tools of communication that must be learned by the young of each community. Variations, not only in dialects, but also in vocabulary and usage, are great barriers to correct translation or communication from one to another and there are also factors which reduce efficiency of transmission.

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between individuals and groups. Errors, misinterpretations and losses in messages, lead to changes in attitudes as well as behaviour. It is clearly necessary to consider some of the basic factors and variables that facilitate or distort language communication.

The first essential is a reasonably common vocabulary into which, through word and sentence organisation, meaning can be built and later interpreted by the person or persons to whom the message is directed. This introduces the whole problem of meaning which has been investigated at length by many, including Osgood and Sebeok \(^2\) although, as yet, no reliable method of measuring meaning has been devised. Cherry\(^3\) listed three questions summarising the difficulties of quantitative measurement, all of which apply to any studies involving language interpretation.

(a) What total range of sounds or words, or gestures or phrases does each use?
(b) How are we to define, standardize and specify utterances?
(c) How are we to prevent confusion between objective and subjective aspects of communication; between personal sense impressions of an individual private to him and his overt behaviour?


Suffice to say at this stage, as Vernon (1950)\textsuperscript{4} noted, that a passage is more than the sum of its parts, thus any kind of grammatical analysis destroys some of the total meaning and changes meanings of the parts. At present, meaning can only be described in subjective terms and any form of numerical analysis must be built up from artificially divided units which must preserve as much of the total meaning as possible.

A second necessity in language communication is a choice between a visual and an oral channel i.e. between written and spoken language through which to transmit the message. Generally, the contemporary situation would decide the channel to be used but there are occasions where a considered choice would have to be made. Distance, time and physical capabilities of travelling often decide that written language must be used while chance encounters and everyday activities presuppose use of oral language. Some investigators like Cherry\textsuperscript{5} and the members of the Social Research Council (1953)\textsuperscript{6} view writing and other systems of communication as secondary to speech. As Cherry\textsuperscript{7}

\textsuperscript{4}Vernon P.E. "An Investigation Into the Intelligibility of Educational Broadcasts". British Broadcasting Corporation.1950.


\textsuperscript{6}Osgood and Sebeok T.A. Op.Cit.

that not more used more words in
sit".

The Research Council quoted above, also pointed out
that spoken systems changed rapidly whereas written
systems were fairly stable. Study of these problems
is further complicated by the fact that the exact
meaning of the terms speech, language and thought are
not agreed upon, as has been pointed out by Carroll
3.

Some of the differences between these two channels are
more obvious than others and have been noted by a few
investigators. Among them Greene 9 found that children
used more words in oral and written expression and that
particular groups of words appeared in each. Quirk 10
and Carroll 11 found differences in construction and
vocabulary while Cherry 12 generally agreed with their
findings. None attempted to find any criteria that
could be used in analysing differences statistically,
and all agreed that there were great problems in doing

3 Carroll, J.B. The Study of Language, Harvard
University Press. 1955.

9 Greene, Harry A. "English-Language, Grammar and
Composition". Encyclopedia of Educational Research,

10 Quirk, Randolph. "Colloquial English and
Communication", Studies in Communication. Communication


THE PROBLEM.

Some of the greatest weaknesses in transmission are losses in detail, errors and other inaccuracies that occur, as well as inadequacies in message transmission whether this be by letter, telegraph, radio or conversation. Merely recording the errors does not go far enough in providing material which can be used in the analysis and understanding of language inaccuracies. The basic essential is to find out what happens to information when it is transmitted from one person to another. More specifically, the problem being investigated in this study is narrowed down to the relative merits of oral and written communication and a consideration of the changes that take place when information is transmitted through these channels. These are to be examined in view of their implications for the classroom.

If we can build up data on transmission of information with this question in view, perhaps some of the variables determining changes will appear. This calls for well-planned tests where as many variables as possible are controlled so that mutilations to the message can be traced to their origin.

Many investigators have pointed out the difficulties involved. Skinner\textsuperscript{13} and Carroll\textsuperscript{14}


\textsuperscript{14} Carroll. Op.Cit.
for example, both emphasised the problem of describing verbal behaviour and thought that a profitable approach might be opened up through trying to measure the meaning through the response it evokes. Many others have contributed to the present knowledge of language since Wundt, as quoted by Carroll, first wrote his treatise on the psychology of language in 1900 and a summary of relevant investigations and findings is important as background to the present study.

SUMMARY.

From these observations on communication the following points may be noted.

1. The multitude of communication situations in everyday life situations.

2. The wide range of difficulties appearing in transmission, leading to many errors.

3. The elusive character of meaning, and difficulty in attempting to standardize procedures.

4. Choice of channels and the particular characteristics of each channel.

5. The changes that take place in a message as it passes from one person to another.

CHAPTER 11.

BACKGROUND TO THE STUDY.

During and since the Second World War much attention has been focussed on mechanical and physical aspects of language communication. The chief purpose of these investigations and experiments, has been the development of communication systems that would prove reliable and accurate over long distances, and under variable conditions of distortion interference and levels of attention on the part of transmitter and receiver or interpreter. Circumstances and locations of war operations raised problems in visual, auditory and electronic systems of communications in large land and sea areas. A continued search was made for simple, efficient and reliable means of transmission of messages so that operations could be continued at a distance. From many experiments conducted by the armed services, a number of facts emerged which led to an improvement in communication. The practical importance of these studies was emphasised in a section of a report \(^1\) on human factors in submarine warfare. Fitts \(^2\) later studied problems in air navigation and airport traffic control.

Among the findings was evidence that physical properties such as crispness, volume and depth of voice of the sender greatly affected clarity and persistence of a message.


The sharp, hard voice was more efficient than the soft, smooth one, the deep-toned one travelled better than the high-pitched one and sheer volume of any one made interpretation easier. Speech intelligibility appeared highly resistant to distortion and was unaffected unless the basic pattern of energy distribution over intensity, frequency and time was impaired and has been noted by Licklider and Miller. Many variations were found that depended upon particular characteristics of speaker and listener and there were wide differences in ability of talkers to be understood and listeners to interpret. The receiver's grasp of language, mental orderliness, familiarity with current idiom and general educational as well as occupational background influenced the interpretation of the message. It would seem that the more completely the receiver fits into the contemporary language situation and the more facility he has with words and knowledge of common terms in everyday speech, the more accurately and quickly will he receive and interpret a message. Miller's experiments with word lists and sentence recall reinforce these conclusions.


Another significant element was the content of the message in relation to expectations of the receiver. Where the receiver had some previous idea of the general nature of the content, a message was more accurately received and interpreted and in some cases prediction of sentence endings became possible. In a similar way, expected and actual length of the message helped to influence interpretation. More errors occurred in long messages and faulty interpretations were more frequent when length of messages could not be predicted.

Historically, communication theories and studies have been divided into first, scientific and physical aspects which include telegraphic, radio and other electronic systems; second, semantic aspects or the science of language as it uses words, and finally the psychological aspect which concerns examination of mental processes contained in thoughts and intentions of a speaker or writer as well as reception and interpretation of language by the receiver. Originally these studies tended to follow their own paths to the exclusion of each other but lately more co-operation has developed between these sub-groups in attacking problems which overlap, so that interdependence of studies has become more apparent. Scientific and physical studies are chiefly concerned with physical difficulties in message transmission. Their problems centre round such questions as electrical interference, extension of effective range and coding of words to suit radio or telegraphic transmission.
If we analyse pragmatic meaning, growth and change of word meaning, we enter the semantic field of linguistics and only enter the psychological area of language communication when we enquire into thoughts and intentions of a speaker, or writer and the reception and interpretation of the message by the receiver.

Many have investigated the psychology of language since Wundt's treatise on the psychology of language, among them Watson, Allport and Wolfe. Most have been concerned with learning of linguistic responses and the relation of this learning to the total behaviour of the organism, but Kantor, as quoted by Carroll, attempted to apply a variety of behaviourism to verbal behaviour and accused many linguists of mentalistic bias.

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Pronko\textsuperscript{10}, emphasised the pragmatic nature of language in interpretation, for a particular context. Skinner\textsuperscript{11} introduced the concepts of "Operant behaviour", instrumental learning and social reinforcement to the studies. None of these has approached one of the most important areas of psycholinguistics with which all forms of communication are concerned that of the nature, order and structure of language used in communication and the effect upon these of the use of verbal and written channels. "Psychologists have too often confused the spoken with the written word, or at least they have assumed too freely that spoken and written words are equivalent stimuli"—Carroll\textsuperscript{12}. In this area are a number of problems closely concerned with topics such as translation of ideas into words, their organisation to suit the channel used to express ideas and translation of words into ideas in the mind of receiver.

In the mind of the first person there exists an idea or thought which he wishes to communicate to a second person.


\textsuperscript{12}Carroll, B.J. \textit{The Study of Language}. Harvard University Press. 1955. p.110.
He first searches for words which will, he hopes, adequately encase the thought. Seldom if ever could exact correspondence between an original thought and an accepted and common meaning applied to a word be expected. So the first person, who is really encoding his thought, must adapt or mutilate the thought in the process of embodying it in words. If he has great ability with words he may be able to use them in such a way as to add or change part of an accepted meaning, as has been done by great writers and poets. Having chosen words and their organisation he must then choose between written and oral expression. As a result of this choice one of these becomes the channel through which his thoughts, now changed to fit language, flow to the second person. Quirk\textsuperscript{13} found many contrasts in form and order between spoken and written English. Cherry\textsuperscript{14} described oral language as loosely structured, fragmentary and very dependent upon the reaction of the listener. He emphasised the pragmatic character of speech and found written language to be static.

Having received the message, either written or oral, the receiver proceeds to translate or decode words into their thoughts as he personally interprets them.

\footnotesize{\textsuperscript{13}Quirk. Op.Cit.  \textsuperscript{14}Cherry. Op.Cit.}
He thus separates meaning from the sound or sight of words. He is directly influenced by the immediate circumstances of the presentation, past experience with words and finally the total context of the message he receives, including physical accompaniments and his own mental set. The same message may therefore be interpreted in a variety of ways depending upon variations in these circumstances. Carroll\textsuperscript{15} includes another area in which the receiver becomes a speaker, or acts in a particular way in direct response to the message. In comparing the thoughts as understood by the hearer with the original thought we will usually find wide variations. As Morris\textsuperscript{16} says - "Meaning lies altogether in the eye of the beholder".

\textbf{ASPECTS OF THE STUDY AREA.}

In all forms of communication, difficulties, losses, misinterpretations and imagined meanings reduce the accuracy and facility with which messages can be transmitted from the mind of one person to another. There are many examples in everyday life of the incompleteness of written and oral instructions and the resultant mistakes, the chance remark wrongly

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\textsuperscript{15}Carroll. Op.Cit.

interpreted and the expected reaction that does not come because meanings have been lost in the communicating process. Situations such as these arise frequently in every classroom and so merit our attention. A major purpose of a class and classroom is the communication of information as a part of the mental, emotional and physical development of children. Communication here is not restricted to teacher-pupil relationships but includes inter-pupil communication. Most of the patterns of the classroom are beyond our grasp but modern means of recording speech have given us a new window into the spontaneous speech of individuals in their conversation. This will be examined further in the next chapter.

Many psychological and semantic studies have been carried out in the field of written language but few have attempted to compare the relative values of oral and written channels of communication. Beighley\(^{17}\) found that reading comprehension was superior to listening comprehension. A later reported work is that of King\(^{18}\) who investigated immediate and delayed recall of material presented orally and in written form. He concluded, among other things, that


(a) Listening was more effective for immediate recall,

(b) the brightest boys and girls recalled facts better when material is read by them and

(c) that with the less academically minded, more facts were absorbed initially if they were presented orally.

The first and third conclusions do not appear to agree with Beighley's findings, but this apparent discrepancy will be considered in detail later.

An area such as this contains many aspects of enquiry clustered about related topics such as thought organisation in language usage, measurement of meaning, reorganisation of language for particular channels of communication, modes and patterns of speech, relationships of language to thinking as well as various coding and decoding processes. Fry\textsuperscript{19} studied the effect of feedback upon conversations and Quirk\textsuperscript{20} directed attention to changes in form and order between spoken and written language. With these as well as Cherry's\textsuperscript{21} analytical work on language,


\textsuperscript{20} Quirk. Op.Cit.

Ogden and Richard's\textsuperscript{22} attempts at measuring meaning, and Carroll's\textsuperscript{23} examination of language behaviour in mind, it is essential to draw up arbitrary limits to the field being investigated and equally necessary to draw upon their work in analysing, classifying and describing experiments and findings.

When considering an area for investigation, it was noted that Greene\textsuperscript{24} has drawn attention to the lack of interest in relationships of language organisation to its effectiveness in transmitting information while Quirk\textsuperscript{25} and Fry\textsuperscript{26} point out the absence of previous studies, and some of the difficulties involved because of the individual character of spoken language. Considering the need for further investigation in these areas, and the modern methods of recording speech now available, the problem area was delineated as being concerned with the effects of different organizational patterns of language materials as they affect interpretation, accuracy of recall, quantity and organisation of material recalled and length of retention. They were to be examined as they were affected in transmission through oral and written channels of communication.

\begin{flushright}
\textsuperscript{24} Greene. Op. Cit.
\textsuperscript{25} Quirk. Op. Cit.
\textsuperscript{26} Fry. Op. Cit.
\end{flushright}
Quirk's example of "Your mother, how is she today?" as a spoken version as against "How is your mother to-day?" in the written form and Miller findings that

"accuracy of recall of sentences increased as the order of approximation to English increased;"

both serve to illustrate aspects of the possible importance of internal structure of language and it's importance in communication. Further encouragement for this line of approach was gained from Carroll who writes

"Whether information measures can be applied say, to classroom learning processes or to complex social interactions is still to be investigated."

It was realised at the outset that these were tentative plans, since the nebulous nature of language materials might produce unexpected difficulties or possibilities which would necessitate changes in emphasis or direction of investigation.

SUMMARY

From the above it can be seen that there has been an increased activity in the psycholinguistic area of communication since the following historical divisions have been made: (a) Scientific and physical. (b) Semantic. (c) Psychological.

Psychological aspects of spoken and written language are still neglected so that inaccuracies arising in transmission remain unexplained. Before profitable analysis can take place the field must be simplified and, because of the fluid nature of oral language, the study must be directed to suit the problem as it develops. The present study is therefore concerned with comparisons of oral with written language.
CHAPTER III.

COMMUNICATION IN THE CLASSROOM.

COMMUNICATION LINKS.

In the classroom situation, effective communication is the primary aim in that teachers are endeavouring, by use of various methods, equipment and environments, to transmit information, learning habits, attitudes and modes of behaviour to pupils. Basic channels through which the pupils assimilate organized material are visual, oral as well as kinaesthetic, which individually and together make learning possible. In recent years, greater use has been made of the kinaesthetic channel, but still the visual and oral appear to be of greatest importance in that they are most commonly used. "Chalk and talk" is still held in high esteem. Most of the newer aids to teaching tend to place even greater reliance upon visual and oral channels, as for example films, radios and more recently, television.

Closer examination of the classroom communication patterns, in terms of visual and oral channels, shows the very complex pattern of relationships established over even a very short period of time. Klausner\(^1\) viewed the classroom as a system of interacting individuals whose social and cultural background influenced

interpretation of signs and symbols. He also drew attention to the individual nature of the interpretation given to teachers' remarks by each pupil. The first and most important relationships are those between teacher and pupil as they function both ways. These two relationships form the basic communication situation, as the teacher, using either his voice or written language, imparts information to each pupil. At the same time he reacts to the pupil's reaction to his own language, as shown for example in the way thought is shaped in response to questions. This general characteristic of communication has been described as 'feedback' and has been discussed in theoretical terms by Wiener. Even in asking a question, the teacher gives some information, as shown in a reconstructed question where the first form has failed to give sufficient clues. In answering, the pupil is communicating with the teacher, again in oral or written language.

Besides teacher-pupil transmissions, there are also many pupil to pupil contacts which allow a continual stream of information to flow from one to another or from one to a group.

An answer, directed primarily at the teacher, is received also by all other pupils within hearing and reacted to by each in a different way. This interaction is emphasised when one pupil's incomplete answer sparks off correct, incorrect and more incomplete answers from other pupils. The speed with which feelings can be transmitted through a class is shown when a humorous situation is first noticed by one, and almost immediately by all others.

Yet a third system of communication exists as pupils and teachers receive information from outside agencies in the form of textbooks, films or radio broadcasts over differing periods of time. These also depend upon oral and visual forms of language as they transmit information in a more impersonal manner.

Considering an average-sized class, there will therefore be a multitude of communication situations where the basic channels are operating throughout the school day. Outside the classroom there will also be language influences that are operating through shorter periods each day.

**NATURE OF INFORMATION COMMUNICATED.**

Passing from how, to what kind of information is transmitted in a classroom we are again faced with a large number of types, many of which are difficult to isolate, although a few major categories can be identified.
(a) Facts (information.)
(b) Techniques for obtaining information.
(c) Habits in both learning skills and behaviour.
(d) Feelings as results of many interpersonal situations.
(e) Opinions resulting from deliberate considerations.

The first of these ranges from single items such as measurements or relationships in arithmetical measures to more complex ideas such as those obtained from a total character study. This, at first glance, seems to be the most important in any school system and lends itself to some degree of measurement and examination as recalled by pupils. The second is similar in that techniques can be learned and examined for error and efficiency. The rest are more long term in their effects and are much more difficult to examine with any degree of accuracy. In school organisation, the first and second are more closely studied and controlled while the rest are left to chance or made the subject of vaguely expressed aims. It is in an effort to limit and control the possible variables in this study that the first kind of information only is included but it might well be that feelings and opinions could be examined by using the right techniques.

When facts, or any kind of information is being taught, many different plans and methods are used in presenting the material. Informal, oral discussions, formal oral lessons, discussion of written information in textbooks and straight copying from textbooks or blackboards are the more common ones. All have one
thing in common—they all depend upon two channels of communication in varying proportions. Language, spoken or written, forms the basis of most instruction and so the efficiency of each helps to control and limit the quantity and accuracy of transmitted information. The teacher is therefore faced with a number of questions in deciding upon the method to be used for each lesson.

1. Which channel is more efficient—oral or written?

2. What is the best way to organize information and details so that most accurate recall will be possible?

3. What kind of style will best imprint the material upon minds of pupils; informal, conversational or written presentation in a formal style?

4. Should the nature of the material decide the channel to be used?

The appearance of tape recorders, films, radio and television has drawn attention to possibilities created by these as teaching aids and hence their relative merits are being questioned. As in other methods of classroom education they also are dependent primarily upon oral and visual presentation, however dramatic it may be, and so the questions apply to material communicated through them.

Normally, after material is presented it is tested by recall some time afterwards. The delay before testing may extend into months and is the only measure, apart from any changes in overt behaviour, that is commonly accepted as being a guide to the amount of information retained by the pupil or subject. What is usually overlooked however,
is not only the plan, language and channel used in transmission of the facts, but the method of recall and seldom is there any detailed comparison of style, plan or type of language with material presented in different ways.

It is chiefly with these questions that this study is concerned. Before proceeding any further it is necessary to analyse communication channels in greater detail and this can only be done by isolating a simplified process which in reality has a multitude of causes, effects and variations. As Carroll\(^3\) says "simple communication channels are necessary where we can identify with much more precision the information at the source, the information at the receiver, and the characteristics of the message".

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The above analysis draws attention to the complexity of communication relationships and their importance in the teaching-learning process. Although kinaesthetic channels are used in teaching, visual and oral remain high in priority. Basic links are between teacher and pupil, pupil and pupil, as well as impersonal agencies as they communicate to teachers and pupils in books and through other media. To impart facts, techniques, habits, feelings and opinions, teachers must choose style and channel of presentation to be used. Similar choices must also be made in planning recall. Before profitable analysis can take place, simplification of the communication process must be carried out.
CHAPTER IV.

NATURE OF THE COMMUNICATION PROCESS.

Many forms of nonverbal communication are used in everyday life, among which are gestures and facial expressions, but our primary consideration in this study, is the field of language communication as it transmits information from one person to another. We are first concerned therefore, with the simple diagram of Carroll's derived from a communication situation.

Source - Transmitter - Channel - Receiver
- Destination.

Another diagram commonly used shows the interaction of common understanding or meaning of terms and gives an idea of some of the weaknesses in the language communication channels.

ACTOR. MESSAGE. INTERPRETER.


In this, signification is the process of coding, by the actor, of the message which in the ideal situation would contain all the intended meaning.

Translation by the interpreter is the process of decoding which again in an ideal case gives all the meaning contained in the message. The message shows three main areas:

1. Where the meaning is common to both actor and translator
2. A meaning read into the message by the actor but not perceived by the interpreter and
3. An area of meaning perceived by the translator but not the actor.

This latter is meaning unconsciously built into the message during the encoding process. A study of both diagrams will help to give an insight into the nature of some of the problems involved. This can be done by following through the sequence of events taking place as a message is transmitted.

Normally a message would originate in the intentive behaviour of the subject who will become a speaker or writer. One could go back further into the stimulus area but a point must be chosen to begin the cycle, although in reality thought and language would constitute a continual flow of physical and mental activity. At this point, the subject makes a decision to communicate some aspect of his experience or understanding. It is difficult to visualize a boundary to the areas of communicable experience, as it involves sensations, thought, concepts and images. Most of these experiences are limited
only by the language available to the actor as he encodes them.

CODING.

Coding, as well as decoding, involves many as yet unresolved problems of analysis. "Almost daily people who deal with communication, - teachers, writers, journalists - are faced with the problem of selecting words to convey their intentions to others." The first question is that of word meanings. Although Osgood and Sebeok devised a system of evaluation of meanings, this cannot be applied to our coding and decoding problems since only meanings common to both sender and receiver give accurate transmission and any additional meaning held by either leads to inaccuracy if it becomes involved.

Accuracy in coding may also vary depending upon which channel is being used for transmission. Although it is clear that there are many differences between oral and written language as has been pointed out by Cherry, Carroll, Quirk, Fry and others, accurate comparisons and evaluations of differences between the oral and written channels in coding difficulties have not yet been attempted.

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Coding is closely bound up with the choice of a channel through which to transmit the message and even here numbers of decisions must be made. Having chosen between verbal and written messages, words and sentences to be used involve selection from those available, with the aim of fitting suitable units to convey the particular meaning. The subject now becomes involved in a complicated series of interacting influences involving words, their meanings, past experiences and the accepted social usages and interpretations. Normally the subject must adapt his message to enable this process to take place since, if the planned message is completely original, exactly suitable words will not be available and roundabout methods become necessary. Whorf\(^4\) even went so far as to claim that the language has a positive influence upon the original thought and there is much evidence to substantiate this theory in the American language which he studied. Losses and inaccuracies must therefore arise in the encoding process and to this must be added any innate difficulties such as limited language experience and word fluency inadequacies experienced by the subject which further reduce the efficiency of communication.

Having coded the message, it must then pass through a channel to a receiver. A number of investigators have examined physical aspects of speech

and have found that they can exert a great influence upon language transmission. Sapir\textsuperscript{5} found that voice dynamics, pronunciation, vocabulary and style played a part while Sebeok, following Lotz\textsuperscript{6} besides Greenberg\textsuperscript{7} examined pragmatic aspects and voluntary and involuntary characteristics of speech. Their tests showed influence from all these factors. In this study however, these variables have been standardized as far as is possible so that greater reliability could be expected of the results.

We are primarily concerned with oral and written channels as they function in the process of communication. Each has its own characteristics and influence upon the message. Quirk\textsuperscript{8} found that verbal language was marked by the use of pauses, intonations and repetitions, and appears to be more closely allied to thought patterns, whereas written language was more artificial, slower and contained a different structure. Before analysing these aspects further, it is necessary to continue following the message to the hearer, or reader, and noting some of


\textsuperscript{7} Greenberg, Joseph H. "Linguistics and Ethnology". \textit{Southwestern Journal of Anthropology.} 4:140.-147.1943.

the factors involved.

All messages are accompanied by noise of some kind or other. Usually we are unaware of these unless our attention is particularly drawn to them or they begin to interfere in transmission of the message. Most are background noises to which we are accustomed although they are almost always missed when there is a complete absence of them. The hearer must therefore distinguish the meaningful from the meaningless and react to the former.

**DECODING.**

The first task of the decoder is to interpret as well as he is able. In doing this he is influenced by a number of factors. Carroll says these discriminatory responses are determined by:

1. The immediately perceived elements of the message.
2. Previously made discriminations in other language experiences.
3. Perceptions arising from the general environment.

Here we may note that the perceived elements are not always the correct or complete elements but only those perceived by the hearer or interpreter. This gives further scope for inaccuracies. Carroll thinks that we tend to perceive the larger units before the smaller ones. The second and third factors are beyond accurate estimation by the sender of the message. He is not always in a position to

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know what the previous experiences of the interpreter have been hence he cannot know exactly what interpretation is to be given to his message. The interpreter will apply more or less experience to it with commensurate results and will be aware of at least some of the conditional probabilities.

His results may also be influenced by a number of tendencies such as those propounded by Gestalt psychologists and presented in a psycholinguistic context by the Social Service Research Council at their Summer Seminar (1953)\textsuperscript{11} Grouping of items because of nearness, similarity and continuity appears to exert an influence depending upon the nature of the material. It can be seen that these could lead to errors but also aid in recall because of the unity they create in perception of a passage. For example the continuity of a sentence helps subjects to recall sections that would otherwise be lost. The principles of closure also apply to language transmission since similar tendencies are manifest in perception and interpretation of completed and incompleted pieces of information. As Bartlett\textsuperscript{12} noted, familiarity with word patterns and common sequences of thought can lead to both easier and correct recall as well as errors, when unfamiliar patterns are used. Many of these


\textsuperscript{12} Bartlett, F.C. Remembering. Cambridge University Press. 1932.
applications, although apt, remain to be confirmed experimentally, but are relevant to the area of this study because of their influence upon coding, transmission and decoding of language.

In addition to this, total context will add to message interpretation. Place, time and humour of persons concerned will greatly influence what is read into the message. Skinner and Carroll suggest that total meaning is in the response it evokes. Some have attempted to classify innate abilities that aid in-accuracy of interpretation. Most noteworthy for our purposes are those of Brown (1945) and Nicholl (1943) as presented by Pratt.


They isolated :-

1. Skills primarily associated with accuracy in listening and
2. Skills primarily associated with reflective listening.

Among the first are :-
(a) Ability to keep related details in mind.
(b) Ability to observe a single detail.
(c) Ability to remember a series of details.

Among the second are :-
(a) Ability to use contextual clues.
(b) Ability to select main ideas as opposed to subordinate ideas or details.
(c) Ability to recognize the relation between main ideas and subordinate ideas that support them
(d) Ability to draw justifiable interferences.

These abilities could easily apply to encoding and decoding of messages both orally and in written form. They give us some idea of the specific abilities operating in the processes concerned.

GENERAL ASPECTS.

From this it will be seen that there are many stages in transmission where errors, insertions and omissions can take place so that it is a wonder that any of a message survives the process. However, a number of factors assist in maintaining accuracy and some of these are the very ones that allow inaccuracies to occur.
When we send a telegram or a message, we reduce it to its basic elements with a minimum of words. As a result, slight inaccuracies in transmission may completely alter the meaning and even make it incomprehensible. e.g. Omission of 'd' in 'Pipes arrived Friday' may give an erroneous impression and cause a plumber to berate the railway staff for late delivery.

In our everyday speech and in written messages also, we usually introduce extra words, pauses and forms of punctuation which give an element of redundancy to the message. John Brown (1953) describes redundancy as a repetition of or overlaying of parts of a message in such a way as to doubly learn a part of all of the information. Greater redundancy would seem invariably to lead to longer retention and greater accuracy in transmission. In practice, many parts or pieces of information are repeated in a passage or conversation so that we can obtain full information even though some of the message may have been lost. Redundancy also tends to overcome characteristic language habits of speakers and reduce consequent inaccuracies. It is very difficult to decide which elements may be omitted and yet leave

the basic information intact. Cherry's opinion was that redundancy was necessary because of the various disturbances from external environment, uncertainties of accent or handwriting and the inadequacies of language itself.

Redundancy is not the only factor which raises the accuracy of transmission. Context of the whole message tends to enable the hearer to fill in any spaces either from his own experience or from other sections of the message. This can also be done by deductions from the physical characteristics of the situation or from the reactions of others who have interpreted the message correctly.

In oral transmission also, tone, pauses and gestures all tend to repeat or extend meanings as well as influence the speaker himself. Skinner saw a large part of verbal behaviour as a response of a speaker to his own prior verbal behaviour. Thinking was viewed as the speaker's manipulation and modification of his own behaviour. This again leads to the question of 'feedback' which is really beyond the scope of this investigation. In written

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language, gesture and tones are absent but a reader still has a context and can refer back to sentences or words and this cannot be done with oral messages. For purposes of investigation, the simple communication channels suggested by Carroll\(^\text{19}\) are necessary

"where we can identify with much more precision the information at the source, the information at the receiver, and the characteristics of the message".

Shannon and Weaver\(^\text{20}\) drew attention to the necessity of measuring the amount of information in the message in order to find out how much actually gets through. Licklider and Miller\(^\text{21}\) found in their tests that less than 50 units of information could be transmitted per second in normal speech. This figure would appear high but they were concerned with every type of communication unit as well as understanding of the speech, nor were they taking losses and inaccuracies into consideration. The chief difficulties here would appear to be


1. In dividing units of language used, because they are part of the particular language structure and

2. Deciding which units of language were used because of the specific message the speaker or writer happens to be communicating.

3. Deciding to what extent the sequences themselves, apart from the symbols, carry meaning.

As yet, no acceptable answers have been found for these questions.

Three major problems in quantitative measuring were noticed by Cherry.

1. How can we discover the total range of sounds or words or gestures and phrases that each subject uses?

2. How can we overcome the difficulties in defining standardizing and specifying utterances?

3. How can we overcome the great possibility of confusion between objective and subjective aspects of communication; between personal sense impressions of an individual, private to him and his overt behaviour.

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It is improbable that the first two questions can be answered unless new methods are found for analysing language. The third question, because of the need for an observer who can report upon the communication process, introduces another subject whose reports must be as objective as is possible under the circumstances. The use of a meta-language is a move in this direction but the major part of the problem remains, since, as Ogden and Richards\textsuperscript{23} pointed out, linguists study a language by being participants. Added to this is the absence of terms carrying a scientific, standardized meaning as has been developed for other sciences. In this absence of satisfactory solutions, an investigator must make many arbitrary decisions as to what constitutes units of language and how meaning is to be defined as well as in standardization in the classification of information and errors.

SUMMARY.

From these considerations it can be seen that by simplifying the whole communication process, coding, adaptation of the message to a channel and decoding can be examined more closely. It is also apparent that many factors both physical and psychological, influence all steps in the process. We would expect to find different characteristics through each channel but previous investigators have found great difficulty in measuring information being transmitted, drawing particular attention to the elusive nature of redundancy and meaning in messages. It is also apparent that an investigator is hindered by his own participation in the language operations so that a meta-language has become necessary. In view of these points, arbitrary judgements are necessary in preparing experimental material and investigations.
The chief methodological problem facing investigators in analysing and comparing the effects of written and oral language is that of following oral speech exactly as it is used in everyday life. Modern methods of recording speech have opened up new fields in this area although there are still problems involved in recording spontaneous oral language. Investigators have the choice of recording either interpersonal oral communications or setting up a suitable situation where spontaneity tends to disappear. If the first choice is used, comparisons are likely to become impossible since conversation tends to follow so many paths, and ideas or structure could not be followed through from the test material given. The second possibility has the advantage that material given and recalled immediately could be related to similar material read and recalled and similarities or differences in replies noted.

In view of these considerations, it was decided to use a tape recorder to record oral replies and later type these out in full for examination and comparison with written replies.
Although there are many apparent possibilities in this method, we must not lose sight of some of the losses, pointed out by Quirk¹ and Fry² among others, that must take place when oral is translated into written language. Tone, voice inflections and volume are the first to suffer. These are lost completely, although some investigators have attempted to invent codes which could be used to record them, but none are particularly successful since their effect on meaning through emphasis cannot be exactly repeated. Recurrent modifiers or "intimacy signal" as well as pauses, lose much of their meaning even if written, but are usually omitted. Finally, there is that complete change of style, much of which cannot be accurately described, but which appears to be based on order of ideas, vocabulary, speaker personality, speed of speech and any immediate response to listener's reactions that may be noted. This last point has been noted by Quirk, and Utterback and Harding's study of the effects of direct presentation as against reading from a manuscript or presenting a tape recorded speech as reported by Fotheringham


and Berquist\textsuperscript{3} helped to extend knowledge of the speaker's response to audience response, labelled 'feedback' by Wiener\textsuperscript{4} among others as previously mentioned.

Nevertheless it is clear that there are areas opened up for investigation by being able to record speech, and so it was proposed to set up conditions which would make it possible to compare language changes as they occurred through oral and written channels of communication. Because of the nebulous nature of oral language and probable difficulties anticipated in interpreting data, choice of the type and construction of the material to be used were postponed until methods of application and testing, which would give most reliable results, had been decided upon. At the same time, as many variables as possible had to be eliminated without losing elements of spontaneity and style of oral language.

The first difficulty was to decide upon a suitable number of subjects for the test. Time taken for recording, typing of replies and availability of subjects while maintaining test conditions, limited the numbers


considerably, hence it was decided to use four types of materials in the first set of tests as a beginning. It was hoped that these would provide sufficient replies for worthwhile analysis and give an indication of the type of material most likely to provide more valuable data. In these tests as many subjects as possible were dealt with as long as test conditions could be maintained and suitable groups of subjects were available. As noted in following chapters, only two groups of twelve subjects in each were given the first tests.

DIFFICULTIES ARISING FROM USE OF TAPE RECORDER.

A number of practical difficulties arose that had not been anticipated and created difficulties in typing replies from tape recorded versions:

1. Background noises. These tended to obliterate the speech, as noises came from other parts of the building and even outside, but better results were obtained by suspending the microphone to eliminate vibrations.

2. Interruptions. Because of the necessity of working in a classroom, even though empty, unexpected interruptions were likely to occur that distracted the attention of subjects and created noises on the tape. For undisturbed recording it was found necessary to place subjects at suitable places beforehand to intercept callers.
3. Familiarity with the tape recorder. Most subjects did not appear at ease at first but suitable rapport was soon established by discussion and short explanations, the tests being begun when the subject had settled down.

4. Recorder manipulation. Practice in recording was necessary and a standard procedure developed to prevent long delays or confusion which tended to distract subjects.

5. Presentation from tape. It was later found unsuitable to record the oral versions on the tape since, as the numbers of subjects grew, so did the delay in turning to a place where the subject's reply could be recorded after listening. This did not apply to written presentation and oral recall however. Eventually it was found more convenient to read the material and a standardized method was attempted.

6. Subject identification. Because of the broken character of some of the replies and the difficulty in separating them later, it was found necessary to record a number with each reply. No further trouble arose.

7. Many subjects spoke quietly so that recording volume had to be increased but this also raised the level of background noises which then interfered with the speech. By experimenting with placing of the microphone and the subject, suitable balance
was maintained although each location required new adjustments.

3. Rapid speech, slurred words as well as pauses and broken sentences created many difficulties at the typing stage and frequently the tape had to be played over a number of times to check statements. Most reliable method was found to be that of noting it phrase by phrase after which a single replay was usually sufficient to check accuracy.

It is quite likely however, in spite of all efforts to place the subjects at ease, that they were influenced by the presence of the tape recorder in their formulation of sentences and perhaps even ideas. We must face the question as to whether this was really spontaneous speech. In it's broader aims, the investigation does not exclude the possibility of finding evidence to provide an answer to this question but it was difficult to see, at this stage, how relevant facts could be expected to appear, because of the tasks involved in deciding what is spontaneous speech and how it would vary from individual to individual. Whatever type of reply was recorded, it was hoped that some degree at least of spontaneity would be obtained and changes, even if only partially indicative of oral language characteristics, would be sufficient to provide data for comparison with written language. When beginning to give replies, it was noticed that few subjects continued to be
obviously affected by the presence of the recorder and almost invariably gave complete attention to the task in hand. Suffice to say that no subjects showed any evidence in their replies of any improvement from their first recording.

Some interpretive problems arose during typing. Chief of these was punctuation to preserve original meanings and emphasis. In most cases sentence sense was completely absent and typing answers in sentences did not appear to be the best setting out. It was decided to use full stops and capitals only where the subject obviously showed the intention of breaking the usual flow of ideas. This seems to have been successful in maintaining as accurately as written language makes possible, the meanings intended by the subjects.

In general, it was found that, by asking subjects if they had seen or used a tape recorder before then passing on to the material in hand and making operation of the recorder as unobstrusive as possible, subjects tended to forget that their voices were being recorded and gave little evidence of further interest in mechanics of the recorder. A few persisted in questions about the recorder and method of operation but this occurred only after recording was finished. Only two subjects asked to hear their own replies.

**Compilation of Test Material.**

Compilation of test material was complicated by the problem of how to measure the information being built into test material and how to arrange the points in
passages to obtain most significant results. Neither Pierce's\(^5\) pragmatic interpretation, Ogden and Richards'\(^6\) functional flow, nor Morris'\(^7\) subjective ideas helped to solve this problem. Separation of points, choice of words, relationships between points and relative importance of points in relation to the whole theme appeared to be the chief difficulties. These were anticipated as being equally applicable to replies as well as test material. It was also appreciated that pilot tests would be necessary and examination of replies might show the need for revision of method in constructing test materials. Tentative, arbitrary decisions were therefore made and revised where necessary. The four passages used in the first pilot experiment were arbitrarily divided into numbers of units which were expressed by groups of words not necessarily equal in number. More detailed descriptions however, are contained in the next chapter.

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SUMMARY.

From a consideration of problems of method the following points appear:

1. Tape recorders have made more extensive study of oral language possible and this method of approach was chosen for this study.

2. It was to be expected that there would be losses of meaning in translating from oral to written language.

3. Chief practical difficulties later discovered in recording and typing replies were:
   (a) subduing background noises.
   (b) accurately translating flow of oral speech, with its weaknesses, into written language.

A tentative approach was decided upon in pilot tests so that a basis for further tests could be established.
PRELIMINARY TESTS.

In setting up organisational patterns that would significantly affect recall of the material, variations considered included

(a) Amount,
(b) Type of material,
(c) Speed of presentation,
(d) Internal structure.

Under these headings descriptive, explanatory or narrative types of material could be used in tests of oral and written recall of the material and were considered as being capable of showing up any differences in their efficiency. The subjective nature of some of the classifications of prose materials and the possible difficulty in establishing a reasonably standardized method of assessing recalled material, suggested that preliminary pilot tests should be carried out for the following purpose:

1. To select the type of material most suited for this kind of experiment.

2. To note the general reaction to this type of presentation and recording so that smooth organisation could be used for further tests.

3. To discover, and eliminate, as far as possible,
any mechanical or practical difficulties in presentation and recording, using tapes. e.g. Identifying of subjects when taping spoken material, rate of speech.

4. To investigate the types of errors introduced by the subjects so that future tests could be constructed using suitable difficulties in controlled situations.

5. To follow up changes in word organisation and logical structure of the passages.

6. To try to establish preliminary data about which type of material or method of reproduction gives greatest reliability of reproduction. e.g. number of facts recalled.

7. As an aid in deciding a suitable length and difficulty of material.

8. To examine the nature and direction which the errors took in recalled material.

9. To find out what type of material survived best in each form of transmission.

10. To try to find a standardized method of assessing results.

With these aims in view, four passages were prepared.

1. An extract direct from a story describing a village in the mountains.
2. A description of a city at, what was hoped to be, a level suitable for the subjects, but in a colloquial style.

3. An extract from a story which contained much direct speech and was reasonably involved in meaning.

4. An almost parallel piece with higher interest level for the subjects and using more colloquial speech.

PRESENTATION AND RESULTS.

The materials (See Appendix A) were divided into a number of ideas as follows:

a. b. c. d.

These contained varying numbers of words and were really "units of meaning". Examples are:
"others were high peaks nearby", "I can't let you in" and "There's a big bridge over the harbour".

Before presentation the materials were recorded on a tape so that all subjects dealt with would receive identical versions i.e. phrasing, tone and speed would be identical. Each test piece was given to a number of subjects in the following manner.

A. Members of Group 1. listened to the materials and then gave an oral account which was recorded, each subject being taken individually. This was named Channel A.
B. Group 2 listened to the taped versions and then wrote an account of what they had heard. This was named Channel B.

Both sets of replies were analysed for the number of ideas recalled.

Subjects for this test were taken from two Standard 3 classes with an average age of 9 at a contributing school. As many children as possible were tested and later, when I.Q. figures, using Otis Tests, were available, balanced groups of ten subjects in each were selected from the results. The delay arose because the children were due to be tested the following year prior to entering an Intermediate School.

<table>
<thead>
<tr>
<th>TABLE 1. SCORES FROM SET ONE TESTS.</th>
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<td>GROUP 1.</td>
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Mean I.Q. 114, Total 136
Mean I.Q. 114.2, Total 202.
Replies in the total group varied from practically no information being recalled to an almost completely correct version of the original passages. There did not appear to be anything consistent about the replies except the advantage of the written recall over the oral. Nevertheless, the results helped considerably in fulfilling the aims of this set of tests.

The first passage appeared to be unsuitable because the ideas in it were not clearly defined and were too far above the ability of the subjects for them to grasp any image at all, hence very little of the passage was recalled. It was also unsuitable because there were too few ideas to show up individual differences, and errors could not be followed up since practically all were in the form of omissions from the original. The small quantity recalled also made it impossible to examine word organisation and logical structure of the ideas. Although the other passages gave greater returns in quantity, similar faults were found and no logical trends could be traced. Subjects appeared to omit all kinds of items without rhyme or reason and changes in the order of ideas took place in only two instances.

FINDINGS.

A number of positive points did appear, and are worth noting:

1. Channel B. emerged as a superior method of communication. In all, 202 ideas were recalled by those using Channel B. as against 186 by those
using Channel A. The superiority of Channel B. was shown with each type of material also.

2. More words were used by the oral group for every passage. Greene\(^1\) noted this also. Although more words were used in the oral replies, the value of this count is questionable for a number of reasons:

a. Repetition of the same words was frequent in oral recall without the expression of any new ideas.

b. Many expressions could hardly be called words. 'Um', 'and' and 'er' come into this category.

c. When writing replies words could be considered, selected or rejected without any record.

3. There was a definite attempt to round off any items that appeared to be illogical, usually at the expense of accuracy. e.g. 'Down the Valley fell great torrents and they went right down the valley or something'. Endings such as 'By it there are some frightful things', and 'Bring some home for me because I like ice-cream' and crossed out words that couldn't be fitted in, as 'there was many a torrent - 'show this tendency in written replies also. In oral replies the subject frequently broke off an idea and finished with 'that's all' or 'I can't think of anything'.

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4. Planned lines of thought were more apparent in the written versions, each with a more logical structure. There were fewer leaps back and forth to different parts of the passages. A typical example is as follows: - "Hello", said the little gentleman, "that is no way to answer the door". "I am wet, Can I come in?". "No, I am sorry but my brothers would beat me even if I thought of it". The dialogue has been reduced to simpler structure, some of the ideas have been omitted yet a logical line of thought is retained.

5. Evaluation of importance of certain sections appeared to influence their recall. e.g. "Valley" and the "High peaks" in Material a. "His brothers would beat him if he did" in Material b. This agrees with Bartlett\(^2\) who noted that facts were selected unwittingly.

6. Subject matter seems to influence recall more than internal structure. The test would tend to support Vernon\(^3\) who saysthat "interest aroused by a talk greatly outweighs in importance any factors of style or language".


\(^3\) Vernon, P.E. "An Investigation Into the Intelligibility of Educational Broadcasts". British Broadcasting Corporation. 1950.
Material d. the birthday party subject, gave a total of 73 ideas through Channel A. and 75 using Channel B. No other total approached this. Other results were: Material a. 26 and 31. Material b. 53 and 53, and Material c. 35 and 43.

7. Although there is a general relationship between the I.Q. rating and results, there are wide variations as is seen in comparing results from subjects 2 and 3 in Group 1. (See p. 53).

SUGGESTIONS FOR NEW TESTS.

When planning new tests it would appear to be necessary to keep the above results in mind as well as attempting to incorporate the following points.

1. Passages would need to be much longer and contain ideas more clearly defined. One of the greatest difficulties in analysing the first test results was the separation of ideas. So broken were they that they would not be followed back to the original piece. Material a. was the weakest in this respect.

2. A more involved pattern of ideas would be necessary so that more errors that could be examined would be introduced by the subjects. Most errors would have to enter almost subconsciously so that the subject would continue to present material that could be examined.

3. The ideas used would have to be within the grasp or experience of the subjects. This was a bad fault
in Material 9, and a less serious one in Material c. In this way difficulty of material would be eliminated as a variable.

4. All new results should be examined from the same points of view and a method of analysis standardized to make the findings as objective as possible.

5. It would be an advantage to place words in the passage relating ideas to each other so that the relationships also could be followed through to the recalled versions. This would also give opportunity for examination of the ability to grasp the relationships and recall them.

Because of the shortcomings of the material used, further examination of the ideas and words recalled did not appear to add anything to the findings. Devising a method of assessing the results showed up the weaknesses in using this type of material. It was first necessary to divide the passage more carefully than had been anticipated into well-defined units which could be traced through to the replies. The decisions made arbitrarily did not necessarily correspond to workable units since the passage was not compiled with this in view. It was also
difficult to decide just how much of the original idea should be required before the subject could be credited with it. It was finally decided that words had to be present to give evidence that the main elements of the idea were remembered. Hence particular words were not important. Key words such as "therefore" except where they occurred accidently, were not built into the material and it proved unprofitable to follow these used since so few were recalled.

This pilot test showed up many of the variables that would have to be eliminated if profitable results were to be obtained in future tests. Although it provided a basis for the next tests in giving an indication of suitable length and construction of materials to be used, few significant tendencies emerged.

SUMMARY.

Although results proved difficult to analysis and insufficient on which to base any real conclusions, they were valuable in showing what was unsuitable material, what type would give better results, and how necessary it was to
define units of meaning as well as relationships in original material. Some problems of analysis of replies also appeared and errors helped to provide data on which to base future tests.
SECOND SERIES OF TESTS.

The first series of tests showed that the greatest differences were noted when comparing the use of oral and written forms of recall of material. To provide a cross check and to extend the scope of the tests, it was decided to use four channels in the next series. Channel A, as for the first series, would consist of oral presentation and oral recall. Channel B, would be oral presentation and written recall while Channels C and D, would comprise written presentation and oral and written recall respectively. By this method it was hoped to be able to compare the merits of each combination of communication channels.

For instance, comparisons would be possible between oral and written presentation from oral as well as written recall. Similarly, effects of oral and written recall were expected to appear. Material for the second set of tests was compiled with a view to emphasising the differences between these channels, keeping in mind the points arising from the first set of tests. A further incentive for this line of approach was derived from Carroll\(^1\)

\(^1\) Carroll, J.B. The Study of Language. Harvard University Press. 1955.
who considered that psychologists had too long taken it for granted that the spoken was equivalent to the written word. Beighley's conclusion that, in his experiment, the subjects who read the material always comprehended it more thoroughly than those who heard it, also suggested broadening of the channels. In addition King's report could be compared if the material was presented through two channels.

COMPILATION OF MATERIAL.

In compiling the passage for the second set of tests, weaknesses discovered in the first series were avoided by choosing twenty arbitrarily defined ideas which were related to each other by key words. The theme of the passage was simple enough for all subjects but the ideas were not always kept in temporal sequence. Using one passage meant that all subjects would receive material of the same difficulty.


The passage was presented through two channels of communication a. Oral and b. Visual. It was recalled also using these two channels as set out below.

**PLAN OF PRESENTATION OF SET TWO MATERIAL.**

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<th>TABLE II.</th>
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<tr>
<td>Group 2. Channel B. Oral presentation-written recall.</td>
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<td>Group 3. Channel C. Written presentation-oral recall.</td>
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</table>

Oral presentation was made using a taped version of the material and subjects giving oral recall were taken individually.

Presentation of test material and recording of replies proceeded more smoothly than during the first pilot tests although delay between orally presenting material from the tape and then recording the last of large numbers of replies became a problem. Eventually groups of five or six were taken each day thus spreading the tests over a number of days.

At this stage I.Q. figures were again not available but groups were balanced as well as possible taking academic performance as a criterion. Later, when the figures became available, balanced groups of six subjects were selected and results compared. The mean I.Q.'s for these groups were as follows:-
Group 1. 112.3 Group 2. 112.6 Group 3. 113.6 Group 4. 112.8

These figures were also based on Otis tests.

METHOD OF ANALYSIS OF RESULTS.

Examination of the replies concerned the following aspects.

1. Key words recalled and understood as shown in replies and comparison of results for each group.

2. Numbering and comparing the facts of ideas recalled by each group using each method.

3. Examination of the capacity to apprehend and recall two or more dependent or conditional ideas.

4. Examination of omissions from the original.

5. Noting and examination of new ideas inserted.

6. Study of any reorganisation of the ideas from the original order.

7. Noting any changes in the material that resulted from the particular channel used.

8. Comparison of results with other relevant data concerning the subjects.

9. Analysis of the results with a view to the improvement of further tests.

For examination and tabulation of the results the same code system was used so that sequences, particular key words and new ideas could be examined from result sheets. Numbers 1 to 20 were used for the original
ideas given and from 21 on for any new ideas introduced. For key words the letters A to O were used, P to Z for new key words as well as doubled letters where necessary. Where possible, the same letter was used for a particular new key word in this and in subsequent tests. e.g. P. was used for "and" in every case throughout. Consequently it was possible to count the number of "ands" used, or any particular idea. New key words with the same meaning were ringed and joined ideas were hyphenated.

Setting up arbitrary units eliminated many of the problems pointed out by Miller⁴ and Osgood⁵ but still many remained. Two original ideas combined into one, two negatives instead of two positives and correct ideas divided by an incorrect one added to the difficulties of classification. In the final analysis however, subjective judgments had to be made, but these were kept as consistent and accurate as possible.

Through using the above system, the following analysis of results became possible:

1. Counting of correct and incorrect ideas recalled.
2. Counting of correct and incorrect key words.
3. Examination of the order in which ideas were recalled.
4. Examination of the order in which key words were recalled.
5. Checking of groups of ideas with the correct key words.
6. Numbers of 'and's' or any other key words used.
7. Noting of any particular characteristics shown by individuals or groups of subjects.

After consideration, it was decided not to compare word counts because, in the case of oral recall, repetitions, apparently meaningless exclamations, and faulty constructions could not be accepted as all being necessary to the expression of ideas and it proved impossible to establish a firm dividing line between the meaningful and the meaningless. Among others, Quirk called these 'intimacy signals'  

6 Quirk Op. Cit.
and attributed an intangible meaning to them which is beyond the scope of these tests, hence a simple comparison of word numbers did not seem to add anything of value to the general picture. Suffice to say that on first comparing the counts from Set. 1. it was quite clear that there were many more words used in recalling the oral versions when the totals were obtained.

RESULTS OF SET 2 TESTS.

In general, results from this tended to confirm the findings of the first set of tests but, because they included four experimental groups, a better basis existed for comparing the various channels.

SCORES FROM SET TWO TESTS.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>76</td>
<td></td>
<td>89</td>
<td></td>
<td>30</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Ideas</td>
<td>18</td>
<td>22</td>
<td>18</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Key Words</td>
<td>24</td>
<td>4</td>
<td>15</td>
<td>(8)</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>New Ideas</td>
<td>65</td>
<td>39</td>
<td>(8)</td>
<td></td>
<td>29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From these results the following may be noted:-
1. Channel B. produced the greatest number of ideas.
2. Most key words were recalled through Channel D.
3. Channel B. gave least erroneous ideas and was closely followed by Channel D.
4. Fewer key words were introduced through Channels B and D.

In addition to these points, numbers of ideas and key words recalled in correct sequence were as follows:

**Channel B.**
- One subject recalled 5 ideas and 2 key words
- One subject recalled 4 ideas and 2 key words

**Channel D.**
- One subject recalled 5 ideas and 3 key words
- One subject recalled 3 combinations of more than two ideas with their correct key words.

As against this, one subject in Channel A recalled two ideas and key word correctly and no correct combinations were recalled in Channel B.

Reorganisation of the items in the test pieces showed a few tendencies that were not pronounced, possibly due to the small numbers that could be included in each group.

**CHARACTERISTICS SHOWN IN REPLIES.**

1. Reversal of two ideas occurred frequently and appeared to be due to language characteristics of the subjects concerned, rather than the nature of the communication channel, since the cases were well distributed throughout replies.

2. Subjects using Channel A, through the inclusion of incorrect items and key words, tended to give disorganised versions.
This was very apparent when trying to assess and classify the ideas in replies but is not shown in final figures.
More repetitions of ideas took place while many pauses and 'intimacy signals' were used as well.

3. Throughout, the subjects seemed to be trying to establish a theme and select the essential ideas. This agrees with what Bartlett7 found to be common in his experiments.

4. Channel B and D replies were logically structured and complete. Sentences, although frequently wrongly punctuated, followed each other simply and logically.

5. Examination of omissions showed that none could be really attributed to the channel used but that most subjects selected the items that were most important, as the theme of their replies. Omissions were fairly equally spread. Notable omissions were 'he was walking down the street', 'he carried it on his arm' and 'he was going out'. Two possible explanations for this could be that (a) they were considered unimportant to the main story or (b) they were unfamiliar expressions or actions. It would be difficult to prove.

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either from this experiment.

6. No close connection could be found between I.Q. rating and performance in the tests. Many in the lower I.Q. levels scored higher than those with much higher I.Q.'s which appears to suggest that another variable may be entering into the tests. However, since the I.Q. means were so close it is unlikely that there would be a wide variation in reading ability.

ERRORS.

Errors did not occur haphazardly but were fitted into the passages in such a way that most of the original meaning was retained. Generally they fell into eight groups:

1. Providing a reason for an action where none was given in the original e.g. John put his coat on to go out.

2. Reversing a statement e.g. He forgot his coat. This could be called a summary of two ideas since it is an accurate condensation of two separate ideas.

3. Providing a solution to a problem situation where none was given e.g. So he had to go home for his sixpence.

4. Summarising a number of ideas e.g. John was going to town. This comes under the difficulty reduction
tendency discussed by Hildreth\textsuperscript{8}.

5. Confusing qualifying words e.g. A cold with a wet day. Here the subject could be giving the only reason why he or she would take a coat or it could be an example of opposites displacing one another as noted by Spearman\textsuperscript{9}.

6. Confusion of meaning e.g. And he remembered he forgot his sixpence.

7. Making a statement that is implied but not actually mentioned in the original e.g. And couldn't take the coat back. Here the subject has progressed from the original statement and implications have been seen.

8. One error leading to others in an effort to complete a logical story. e.g. He felt in his pocket for the fare home but it wasn't there so he had to walk home. This type could also be classified as those arising from loss of the 'task set' as noted by Lawrence\textsuperscript{10}.

\textsuperscript{8}Hildreth, C. "The Difficulty Reduction Tendency in Perception and Problem Solving". \textit{Journal of Educational Psychology}. 1941. 32. p.305.


From a comparison of ideas recalled and omitted, individual characteristics are apparent. One subject would omit one out of every four or five ideas and another whole group of ideas. The central theme of the passage appeared to be the guide and was recalled in every case. If the subject strayed away from this it seemed difficult to get back to the original theme, so a group of ideas would be omitted or new ones included. Most subjects omitted single, odd ideas for reasons which would probably be most difficult to discover.

Treatment by the subjects of the various ideas merits our attention. Both 'he was walking down the street' and 'He carried it on his arm' were omitted by 17 of the 24 subjects. Next came 'he was going out' with 14, and 'someone had handed it in' with 13. These ideas would seem to be rated as unimportant and perhaps children, since they would so seldom carry a coat on one arm, considered that an unusual and unnecessary idea. Most of these errors tend to confirm the opinion of Brigham (1932) as quoted by Lawrence 11 that errors tend to be orderly rather than capricious.

If accuracy of recall can be accepted as a measure of comprehension, then the above results

11 Lawrence. Ibid.
conflict with Beighley's\textsuperscript{12} conclusion that the evidence from previous research favours hearing as a more effective method of comprehension. The tests agree with what Beighley himself found, that reading is more reliable than listening for transmitting information. They completely disagree with the findings of Trenaman\textsuperscript{13} who says

"the scores of the listeners are also very slightly higher than those of the readers at all educational levels, for both immediate and delayed recall", when he was reporting on the study of understanding of radio broadcasts. They are also at variance with the conclusions of both King\textsuperscript{14} and Goldstein\textsuperscript{15} who, in different experiments, found listening to be superior to reading for comprehension. Unfortunately none of these investigators included oral and written recall in their experiments.

\begin{itemize}
\item \textsuperscript{12} Beighley. Op. Cit.
\item \textsuperscript{13} Trenaman, J. "Understanding Broadcasts on Science". Paper read to British Association for the Advancement of Science. 1950.
\item \textsuperscript{14} King. Op. Cit.
\item \textsuperscript{15} Goldstein, H. Reading and Listening Comprehension at Various Controlled Rates. New York. 1940. (as quoted by Beighley)
\end{itemize}
TENDENCIES SHOWN.

In these tests a number of general tendencies appeared:—

1. There was an obvious intrusion of personal vocabulary in the orally recalled versions. Such expressions as 'never had a sixpence' and 'hopped on the bus' did not occur in the written replies.

2. Material in written recall showed a more formal sentence structure. The juggling of ideas to fit in key words tended to give the written replies an artificial character, while oral replies flowed on, joined by 'and', to include large numbers of ideas in one sentence.

3. Speech habits and characteristic modes of expression appeared to shape many of the ideas expressed orally and often seemed to influence the sentence structure and line of thought. An example of this was 'He felt in his pocket for his fare home but it wasn't there so he had to walk'. Apparently the subject connected the sixpence with bus fare and was thus misled. These tendencies were shown to a much greater extent by some individuals than by others.
All of these trends could obviously stand much further investigation and agree with the analysis of the changes in language in studies of communication and recall, particularly those of Bartlett, Quirk and Fry.

From individual questioning of the subjects and the examination of replies, it would appear that three underlying tendencies or habits were operating in deciding the shape and structure of the replies. The first and most powerful seemed to be the recent experience of the subjects. Of four subjects who made errors in the section dealing with the losing of the coat, all four had lost articles in shops or buses within some months before the tests were taken. Here there is a resemblance to conation and affection causing errors as noted by Spearman.

Three boys, questioned about what type of weather would force them to wear an overcoat all maintained they would only wear one for rain. All had implied or stated that John had put his coat on because it was raining.

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The second was for subjects to give a reason for an action or complete a part of the story to round it off. This tendency was apparent in Bartlett's subjects who introduced items to rationalise the story of the ghosts. One subject said that John had to go home to get a sixpence to recover his coat. Here the subject has followed the obvious line of action without regard for accuracy. Many subjects reorganised the same section which lent itself to this by its wording and structure. All gave logical reasons or explanations but only one gave a completely accurate account.

The third tendency was the introduction of the word 'and' at every available opportunity. In most cases the result was a simplification of the relationships. The original version contained one 'and' which was seldom reproduced in the correct place. Introduced 'and's were most common in oral recall with Channel B again giving the best result for accuracy.

Relevant results were:— Channel A. 34.

Subjects displayed individual habits, some spreading 'and' throughout their replies while others used it sparingly or not at all. For many it would appear to be a word used from habit which provided a 'thinking space'.
SUMMARY.

Taking results of recall of ideas, key words and correct consecutive combinations of ideas into account, as well as errors included and numbers of 'and's used, written, as in Channels B and D., is clearly superior to oral recall in total quantity and accuracy of construction. Oral presentation and oral recall proved to be particularly inadequate in transmitting information. Written presentation apparently reduced the inaccuracy in oral recall but results are still not equal to those using written recall. These differences are greater than was expected and of some significance since the great majority of communication takes place through oral channels. It could be reasonably expected that greater familiarity with oral communication and its independence of the difficulties of written words would give it a greater degree of reliability, but this is apparently not so.

Although various tendencies were apparent in the second set of tests, it was considered necessary to increase the difficulty of the material so that a temporal sequence would not be so obvious and more errors would be unwittingly introduced by subjects. The greater numbers of errors thus obtained would also tend to give results a sounder numerical basis. Consequently new material was prepared for a third set of tests.
CHAPTER VIII

SET THREE TESTS.

COMPILATION OF MATERIAL.

In the light of experience with Set 2 tests the recall of facts or ideas was considered the most important aspect and so material for Set 3 was compiled with this in view. It was also made more difficult in order to emphasise errors, and although an attempt was made to increase difficulty by increasing the complexity of sentence structure, as Bartlett found it was difficult to decide objectively what was easy and what was hard.

In this way, it would make it possible to follow up more adequately omissions, new key words and ability to apprehend and recall two or more items. It was planned to avoid one characteristic of Set 2 material by using ideas that did not fall into a sequence too readily and which depended to a greater extend upon the key words for their unity and total meaning. Since no subjects had correctly recalled and placed the ideas and key words of Set 2 material and all recalled sufficient to have made errors,

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Set 3 material was compiled on similar lines. Twenty arbitrarily chosen ideas were linked into six sentences by using thirteen key words. The central theme of the passage concerned learning to swim which was very topical at the time. (See Appendix A for passages).

APPLICATION OF THE TESTS.

In all, 48 subjects were taken in four matched groups with twelve subjects in each.

FIGURES FOR SET THREE SUBJECTS.

<table>
<thead>
<tr>
<th>TABLE IV.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Ages and I. Q.</td>
</tr>
<tr>
<td><strong>G.1.</strong></td>
</tr>
<tr>
<td>Age: 11.2.</td>
</tr>
<tr>
<td>I.Q. 115.25</td>
</tr>
</tbody>
</table>

As can be seen from these, mean ages for groups 2 and 4 are lower than for groups 1 and 3. The subjects were chosen from three classes at two levels—Std. 3 and 4. This was necessary because there were insufficient subjects available in the upper class. It was hoped that this did not affect results unduly but it was felt that equivalence of I.Q.'s was actually more important provided there was not too great a difference between the mean age levels.
30.

As for Set two, the material was presented to each group using four channels.

PLAN OF PRESENTATION OF SET THREE MATERIAL.

<table>
<thead>
<tr>
<th>G.1</th>
<th>Channel A</th>
<th>Oral presentation - Oral recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.2</td>
<td>Channel B</td>
<td>Oral presentation - Written recall</td>
</tr>
<tr>
<td>G.3</td>
<td>Channel C</td>
<td>Written presentation - Oral recall</td>
</tr>
<tr>
<td>G.3</td>
<td>Channel D</td>
<td>Written presentation - Written recall</td>
</tr>
</tbody>
</table>

ANALYSIS OF RESULTS.

After results were compiled the process of analysis followed the same pattern as for Set 2. Numbers 1-20 were used for ideas and A-M for key words. Similar difficulties were met in deciding which ideas had been recalled and where the dividing lines could be drawn. There appeared to be a wider variation in the numbers of items recalled by subjects. e.g. Channel A. Set 2 score varied from 11 to 13 but Channel A Set 3 scores ranged from 8 to 13. These differences were found to be even greater in Channels B and C. This could be due to the greater numbers of each group in Set 3 but the main contributing factor would probably be the difference in the structure of the material used. This opinion is reinforced by comparing the total numbers and key words, both correct and incorrect, given as replies by individuals. Every group in Set 3
showed wider variation in scores. It must be remembered also that the material was designed with a greater degree of complexity with the idea of introducing more errors.

**SCORES FROM SET THREE TESTS.**

<table>
<thead>
<tr>
<th>Ideas Recalled</th>
<th>Key Words</th>
<th>New Ideas</th>
<th>New Key Words</th>
<th>Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.1</td>
<td>133</td>
<td>41</td>
<td>19</td>
<td>60</td>
</tr>
<tr>
<td>G.2</td>
<td>155</td>
<td>62</td>
<td>16</td>
<td>29</td>
</tr>
<tr>
<td>G.3</td>
<td>112</td>
<td>36</td>
<td>17</td>
<td>64</td>
</tr>
<tr>
<td>G.4</td>
<td>152</td>
<td>57</td>
<td>8</td>
<td>25</td>
</tr>
</tbody>
</table>

Numbers of ideas recalled show a positive advantage for Channel B, with D following closely. This is in complete agreement with the second set of tests. Set 1 results also agree, when considering Channels A and B. Channel C, however would appear to be less reliable than Channel A which is the reverse of Set 2 results. That reading difficulty could account for this is not borne out when channels B and D are compared. If difficulty in reading had been the reason then G.4. results could not be expected to be so close to the G.2. results. Examination of individual replies showed that low scores were obtained by 6 of the 12 subjects so that the low total was not due to one or two very weak subjects. One subject scored much higher than any in G.1. which further emphasises the differences. Perhaps an explanation...
for this low score could be found by investigating some of the specific linguistic difficulties involved in translating written into oral language as well as the reverse process but such investigations would appear to be beyond the scope of the present study.

From this set of tests, as in the first and second sets, the superiority of written over oral recall of ideas is very obvious. The advantage shown in Set 2, of written presentation before oral recall has disappeared and this would seem to be due to the nature of the material used in Set 3.

Recall of each idea seems to be similar through all channels although there were a few variations, chief among these being the name given to the passage. Only six subjects correctly recalled it and four of these were in G.4. using Channel D. Visual presentation and written recall would seem to impress the title much more clearly. Bartlett<sup>2</sup> found also that the title was one of the commonest errors and concludes that

"the importance of titles is strongly exaggerated".

<sup>2</sup> Bartlett. Ibid.
Two ideas, "hopes to be able to swim properly" and "he returns to school next year", survived much better through oral presentation in Channels A and B. This could be because subjects tended to identify themselves with the personality perceived in the material as was noted with Set 2 tests, or then again, form of presentation could have affected the mental image, leading to emphasis on different aspects of the material.

Taking totals into account, the name was recalled only six times and "the weather does not become cold" only nine times. "John is not allowed to swim at Brighton" headed the scores with 46 recalls and was closely followed by "he has a cold" with 42 recalls, then "he has a new bathing suit" with 41, "there will be a prize for the best learner" with 40.

Two factors would appear to be influencing recall of items.

1. First items tended to be remembered best followed by the last ones and finally those centrally placed, compare serial recall phenomenon discussed in McGeogh and Irion³

2. This order is affected by a further factor, namely the interest attributed to an idea or its relative importance, hence there is a fairly high score for the eleventh idea (29 recalls) which was "he will be allowed to have a swim".

The 7th, 8th, 9th and the 12th and 13th ideas seem to have been placed in the weakest recall area or perhaps their interest level was rated as low. Apart from the two ideas mentioned above there seemed to be little alteration that could be directly attributed to the channel through which the material passed.

New ideas introduced into recalled material were as follows:

Channel A. 19  Channel B. 15  Channel C 17  Channel D 8

The fewer numbers recorded for Channel D is evidence for the greater degree of accuracy of this channel and also helps to reinforce the idea that subjects using oral language tended to become personally involved in the material. Piekarz⁴ (1956) found this tendency was limited to lower level readers, but this was not the case as far as these tests were concerned. Typical of the new ideas was "so his mother kept him in bed" and "he wanted a new pair of togs and his aunty wouldn't buy them for him".

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These could have been caused by lapses of attention, or a desire to recall an idea where only a word could be identified or again, an intrusion of previous personal experiences. However, results from these tests are insufficient evidence on which to base further analysis.

ERRORS.

An analysis of errors, suggests seven reasonably homogeneous groups into which all could be grouped:

1. Most common error was the addition of information about an idea, giving reasons for an action or adding the result of the actions. Fourteen subjects did this as against 20 in Set 2. Between hearing or reading the material and its reproduction, there would appear to be a tendency for it to change and adapt, thus leading to conclusions and implications. Possible closely related lines of development have been pointed out by Bartlett⁵ and Lawrence⁶.

2. There were nine errors which involved statements about ideas, or the story. "It is about John" was the most common.

Most of these occurred in Channel C and would seem to be evidence of a detached view of the material which led the subject to give a summary or title. The closest error to this noted in Set 2 was the summarizing of a number of ideas, of which there were four examples. Set 3 produced four of these summaries. These errors recall Zipf's 'Principle of Least Effort' which was deduced from the simplifying of words and language usage he noted.

3. There were seven cases where there was an obvious confusion of meaning when reading or hearing the material. In one example "has a cold" became "because of the cold". Exact meaning of this could be debated but it was presumed to be an error. There were five similar errors found in Set 2. replies. This type of error could also be included in those caused through dislocation of the elements in a problem as discussed by Lawrence.  

4. Four cases were noted in which the original idea had been reversed. Thus "hopes to be able to swim at Christmas" became "will not be able to swim at Christmas".

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Lawrence. Ibid.
Two similar errors appeared in Set 2. There is a likelihood that these arose from a confusion with other ideas given. In one idea John was allowed to swim while in another he was not and these could easily have confused subjects. Spearman's\textsuperscript{3} theory of opposites displacing each other because of contiguity also offers an explanation.

5. Another frequent error, 9 cases, was the confusion of two or more ideas. This would seem to arise from their similarity in the original material and in later tests this was avoided. These did not appear to favour any particular channel.

6. There was only one example of a sentence being completed with an erroneous idea which seemed to show a compulsion to complete the sense. This appears to be related to the tendency to fill in unperceived details to make the story more rational as noted by McGeogh and Irion\textsuperscript{9}

\textsuperscript{3}Spearman. Op. Cit.

\textsuperscript{9}McGeogh and Irion. Op. Cit.
In Set 2 there were two examples of this error.

7. One most interesting error occurred only in Channel B. Seven of the subjects gave "The New Bathing Suit" as the title and all of these were in G.2. using Channel B. One explanation could be that they realised there was a title and presumed it summarized the story. An additional reason could be the interest level of this aspect of the material. No explanation as to why this was limited to Channel B. or why it came about at all appeared in any of the results. The correct title was recalled only 6 times and four of the subjects were members of G.4 using Channel D. This recalls Spearman's analysis of anticipatory and simultaneous influence as being causes of errors although his theories throw no light upon why this particular error was limited to one channel.

ERRORS IN SPECIFIC CHANNELS.

Although there were fewer reversals of ideas in Channel C and D, the differences are not great

enough to be of any significance. Certain sequences such as "he has a new bathing suit which his aunty gave to him a month ago", seemed to lend themselves to reversal but this could not be attributed to the channel used. Subjects showed individual characteristics and ranged from those with very ordered patterns of every idea recalled in its correct sequence to those who frequently misplaced ideas, some jumping whole groups of ideas then going back to a correct order. Most seemed to select a core of central facts as Bartlett\textsuperscript{11} found with his subjects.

Of more significance was the repetition of ideas. Numbers for these were:

\underline{Channel A 12 Channel B 4 Channel C 11 Channel D 0.}

Written recall, either because it gave more time or because material could be re-read, gave fewer repetitions and Channel D none. Channel A showed examples of immediate repetition, apparently a "thinking space", as well as later repetitions where subjects seemed to be unaware of having recalled the idea previously.

\footnote{Bartlett. Op. Cit.}
KEY WORDS.

To be accepted, key words had to be correctly placed with either one or two ideas correct also. Figures for correct and incorrect key words are given below as well as words used that had the same meaning as original correct ones.

KEY WORD RECALL.
SCORES FOR SET THREE TESTS.

TABLE VII.

<table>
<thead>
<tr>
<th>Channel</th>
<th>A.</th>
<th>B.</th>
<th>C.</th>
<th>D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct Key Words.</td>
<td>41</td>
<td>62</td>
<td>36</td>
<td>57</td>
</tr>
<tr>
<td>Incorrect</td>
<td>60</td>
<td>29</td>
<td>64</td>
<td>25</td>
</tr>
<tr>
<td>Others Same Meaning.</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

It will be noted that Channel B gave the most accurate recall with Channel D following. From these figures, it would seem that written recall is much superior to oral recall with regard to key words, and this agrees with the previous tests. Figures for incorrect key words used seem to rise as the correct ones fall suggesting that many subjects "fill in" with incorrect ones. The comparatively low totals for each group, out of 156 possibly correct words for each group, shows
how inaccurately the material has been transmitted by even the best group. Another tendency is the use of words of similar meaning. Some subjects used two words to convey an understood meaning for the forgotten word.

Examination of the ability of subjects to apprehend and recall two or more consecutive ideas and their key words correctly gave the following results:

SCORES FOR APPREHENSION OF TWO OR MORE CONSECUTIVE IDEAS FROM SET THREE TESTS.

<table>
<thead>
<tr>
<th>Channel</th>
<th>A.</th>
<th>B.</th>
<th>C.</th>
<th>D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Ideas &amp;</td>
<td>24</td>
<td>38</td>
<td>22</td>
<td>42</td>
</tr>
<tr>
<td>Key Word</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 2</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

These show a clear superiority for written recall as well as a slight advantage for written presentation. Some subjects showed positive ability in this respect and recalled more than one combination. In G.I. Channel A one subject recalled five correct groups while some others recalled none. Most notable however, were two subjects in GA using Channel D one of whom recalled 7 ideas with 5 key words correctly placed and a second recalled 5 ideas with 3 key words.
correctly placed. No other performance approached this.

While from the group totals it could be said that written language favoured comprehension and recall of two or more ideas, study of individual scores shows a definite individual ability. Three subjects who scored highly had I.Q's of 129 and 132. It was also noted that subjects of about 90 plus scored poorly. One very high I.Q subject in 6.3 produced only two correct combinations. One would expect ability in this process to follow I.Q's fairly closely but scores appeared to vary regardless of ability in all but the few cases mentioned.

Treatment of individual key words was fairly consistent throughout. Most often recalled was the first "because", probably because of its placing and also because of its work in linking the first two statements which were most often recalled correctly. The first "when" survived best through Channel D although the first "if", the final "and" and final "because" were more frequently recalled through Channel B. In general, key words appeared to be considered important only in their work in linking ideas and not as significant in themselves.

Of incorrect key words used, "and" was most frequent with a very wide variety of others less
frequent. Comparison of the total numbers of "and" with numbers of other new key words shows the following:

<table>
<thead>
<tr>
<th>Channel</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Key Words</td>
<td>60</td>
<td>29</td>
<td>64</td>
<td>25</td>
</tr>
<tr>
<td>Ands</td>
<td>41</td>
<td>10</td>
<td>50</td>
<td>9</td>
</tr>
</tbody>
</table>

Individual scores showed small but similar variations but the totals clearly show the influence of the channel being used.

**SUMMARY.**

Conclusions from Set 3 tests may be summed up as follows:

1. Results were very similar to those of Set 2 in that written recall proved to be superior in accuracy of transmission.

2. Taking ability to apprehend and recall two or more consecutive ideas correctly into account, written presentation and written recall were clearly superior.

3. Types of errors were very similar to those found in Set 2 replies although increased complexity of the material was the probable cause of an increased
percentage.

4. Oral recall from written presentation was unexpectedly less accurate than oral recall from oral presentation. The order of accuracy was the reverse of Set 2 replies. The only apparent cause for this was similarity of some of the ideas which led to confusion, and readers may have been affected more than listeners.

5. Two factors tended to reduce the significance of results:-

a. Using one passage only did not make it possible to check individual subject reactions to different materials.

b. Testing subjects through one channel only could give no idea of possible performance through other channels.

In order to extend the scope of the investigation to avoid previous failings and to provide as many cross checks as possible, it was decided to use four equated passages and present all to four groups using a different channel for each group. Further details are given in the chapters following.
CHAPTER IX.

SET FOUR TESTS.

COMPILATION OF TEST MATERIAL.

In arranging this set of tests, it was intended to try to overcome as many of the disadvantages discovered in previous tests as possible and at the same time to test the same channels more accurately. More particularly the following points were kept in mind:-

1. Some statements in Set 3 tended to be confused with others and a number of subjects combined two or more ideas. Material for future tests would be more satisfactory if
   a. ideas were not too similar and
   b. key words were used only once.

2. An even greater dependence of one idea upon another would be an advantage even if it became necessary to reduce the number of ideas since an average of less than two thirds of the possible total ideas were recalled by each group. Emphasis on comprehension and recall of the whole would seem to be preferable to single ideas and key words.

3. Following up the tendency shown in Set 3, where Channel C showed individual differences,
by testing each subject through four channels it might be possible to discover whether subjects tended to have particular facility in using one or more of the channels or whether any specific difficulty appeared in one of the operations of converting oral to written language or vice versa.

4. In compiling equated materials, ideas and themes should be kept as dissimilar in subject matter as possible. Key words and the structure of related and dependent ideas should be arranged similarly in different test materials.

Five passages, lettered a, b, c, d, e, were composed of fifteen ideas joined by twelve key words which were used in a similar construction in each passage. Subject matter varied widely and construction was as complex as possible, taking into consideration the difficulties inherent in building similar constructions into the passages. The fifth passage was compiled to be used as a check if any errors occurred in presentation of any of the other passages. (Note: see Appendix A for content of passages).

APPLICATION OF THE TESTS

Thirty-six subjects were divided into four matched I.Q groups.
MEAN I.Q. SCORES, AGES AND A.C.E.R. GROUPS
FOR SET FOUR SUBJECTS.

TABLE X.

<table>
<thead>
<tr>
<th>I.Q.</th>
<th>G.1</th>
<th>G.2</th>
<th>G.3</th>
<th>G.4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>108.2</td>
<td>108.1</td>
<td>108.1</td>
<td>108.2</td>
</tr>
<tr>
<td>Chronological Age.</td>
<td>11y.3m</td>
<td>11y.2m</td>
<td>11y.2m</td>
<td>11y.3m</td>
</tr>
<tr>
<td>A.C.E.R.Age Group.</td>
<td>5.6</td>
<td>5.9</td>
<td>5.9</td>
<td>5</td>
</tr>
</tbody>
</table>

In sorting the subjects I.Q's were matched where possible except when it was necessary to balance a group. They ranged from 34 to 131 and chronological ages from 10y.3m. to 11y.9m. Extremes were omitted from the tests since they might unbalance the groups in performance.

TEST PLAN FOR PRESENTATION OF SET FOUR MATERIAL.

TABLE XI.

<table>
<thead>
<tr>
<th>Channel.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>aI</td>
<td>b G</td>
<td>cI</td>
<td>d G</td>
</tr>
<tr>
<td>Group 2</td>
<td>dI</td>
<td>a G</td>
<td>bI</td>
<td>c G</td>
</tr>
<tr>
<td>Group 3</td>
<td>cI</td>
<td>d G</td>
<td>aI</td>
<td>b G</td>
</tr>
<tr>
<td>Group 4</td>
<td>bI</td>
<td>c G</td>
<td>dI</td>
<td>a G</td>
</tr>
</tbody>
</table>

A.B.C.D. are the four channels used.
Groups 1 - 4 are the groups of subjects.
a.b.c.d. are the materials used.
As in previous tests Channels A and B represent oral presentation with oral and written recall respectively and Channels C and D represent written presentation with oral and written recall.
I = tested individually.

G = tested as a group.

By using this plan it was hoped to be able to carry out the following investigations in addition to following up results from previous tests.

1. Follow up group and individual performance through each channel as a check for the equality of the group.

2. Check difficulty of each passage through comparison of results obtained by groups with that passage.

3. Since every material would be communicated through every channel, difficulties arising through the use of a particular channel would be isolated.

4. Since there would be only nine subjects in each group, by using the above plan totals for the four groups using each channel, could be used.

Two methods of presentation and recall were used, group and individual. Where oral replies were recorded, subjects were taken individually and where written replies given, subjects were taken
in groups. In all, sixteen tests were administered to the groups, involving 144 replies.

NUMERICAL ANALYSIS OF REPLIES.

As for Sets 2 and 3, ideas in each passage were numbered from 1 to 15 and key words lettered from A to L. Ideas were accepted:

a. Where there was evidence of full understanding of the basic sense intended regardless of specific words used to express the idea.

b. Where there were sufficient words to show that a reasonable part of the idea was apprehended.

No recall was credited unless definite evidence was present in the reply. In some cases there was faint recognition shown through reorganisation of the other ideas or an implied understanding, but the ideas were not accepted in these cases.

Totals for correct ideas recalled, correct key words, new ideas introduced and new key words used were calculated and results are set out below.
### TABLE XII.

<table>
<thead>
<tr>
<th>Ideas</th>
<th>A.</th>
<th>B.</th>
<th>C.</th>
<th>D.</th>
<th>Group Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G.1.</td>
<td>69</td>
<td>81</td>
<td>75</td>
<td>74</td>
<td>299</td>
</tr>
<tr>
<td>G.2.</td>
<td>59</td>
<td>75</td>
<td>60</td>
<td>74</td>
<td>268</td>
</tr>
<tr>
<td>G.3.</td>
<td>64</td>
<td>71</td>
<td>67</td>
<td>70</td>
<td>272</td>
</tr>
<tr>
<td>G.4.</td>
<td>67</td>
<td>31</td>
<td>71</td>
<td>73</td>
<td>292</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td>259</td>
<td>308</td>
<td>273</td>
<td>291</td>
<td>1131</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Words.</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G.1.</td>
<td>11</td>
<td>17</td>
<td>25</td>
<td>18</td>
<td>71</td>
</tr>
<tr>
<td>G.2.</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>25</td>
<td>66</td>
</tr>
<tr>
<td>G.3.</td>
<td>16</td>
<td>12</td>
<td>5</td>
<td>21</td>
<td>54</td>
</tr>
<tr>
<td>G.4.</td>
<td>16</td>
<td>23</td>
<td>19</td>
<td>12</td>
<td>75</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td>56</td>
<td>71</td>
<td>63</td>
<td>76</td>
<td>266</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New Ideas.</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G.1.</td>
<td>25</td>
<td>25</td>
<td>33</td>
<td>33</td>
<td>116</td>
</tr>
<tr>
<td>G.2.</td>
<td>27</td>
<td>22</td>
<td>26</td>
<td>20</td>
<td>95</td>
</tr>
<tr>
<td>G.3.</td>
<td>36</td>
<td>19</td>
<td>29</td>
<td>28</td>
<td>112</td>
</tr>
<tr>
<td>G.4.</td>
<td>32</td>
<td>29</td>
<td>30</td>
<td>22</td>
<td>113</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td>120</td>
<td>95</td>
<td>113</td>
<td>103</td>
<td>436</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New Key Words.</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G.1.</td>
<td>67</td>
<td>43</td>
<td>67</td>
<td>45</td>
<td>222</td>
</tr>
<tr>
<td>G.2.</td>
<td>53</td>
<td>42</td>
<td>51</td>
<td>33</td>
<td>184</td>
</tr>
<tr>
<td>G.3.</td>
<td>73</td>
<td>33</td>
<td>79</td>
<td>36</td>
<td>221</td>
</tr>
<tr>
<td>G.4.</td>
<td>64</td>
<td>52</td>
<td>71</td>
<td>40</td>
<td>227</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td>237</td>
<td>170</td>
<td>268</td>
<td>159</td>
<td>854</td>
</tr>
</tbody>
</table>

### Value of the Plan of Testing.

1. With the exception of Group 2, whose results appear to rise and fall to a much greater extent than the others, total group results
are fairly stable. Group grand totals show that groups where well balanced. In addition, scores for the four groups in each channel show performances that are reasonably consistent.

2. Comparative scores obtained with different passages are set out below.

TOTAL SCORES FOR EACH MATERIAL IN SET FOUR TESTS.

<table>
<thead>
<tr>
<th>Material</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel A</td>
<td>69</td>
<td>87</td>
<td>64</td>
<td>59</td>
</tr>
<tr>
<td>Channel B</td>
<td>75</td>
<td>81</td>
<td>81</td>
<td>71</td>
</tr>
<tr>
<td>Channel C</td>
<td>67</td>
<td>60</td>
<td>75</td>
<td>71</td>
</tr>
<tr>
<td>Channel D</td>
<td>73</td>
<td>70</td>
<td>74</td>
<td>74</td>
</tr>
<tr>
<td>Totals</td>
<td>284</td>
<td>278</td>
<td>294</td>
<td>275</td>
</tr>
</tbody>
</table>

These totals suggest that the passages are acceptably similar in difficulty.

3. All groups gave similar performances through the same channels showing that similar tendencies were operating e.g. all groups have lowest scores through Channel A and highest through Channel B.

3 All things considered, the average level of recall was fairly low. Of 15 ideas in the original passage, an average of only 7.8 was recalled. In group totals an average of only 16.6 key words were recalled out of the possible
In all, 436 erroneous ideas were introduced or a little over 3 per subject. These figures would suggest that very little of the original material survived, yet all appeared to give a reasonably accurate total account of the passages.

We are reminded of the high resistance to interference found by Licklider & Miller and may assume that general meaning is also highly resistant to internal errors in transmission.

**IDEAS RECALLED.**

From the results concerning numbers of ideas recalled a number of points may be noted.

1. All groups in this set of tests, gave their best performance, however slightly superior, when using Channel B. On the other hand, lowest figures resulted in every case when the passages were communicated through Channel A. Totals for all groups through each channel were as follows:

<table>
<thead>
<tr>
<th>CHANNEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCORE</td>
<td>254</td>
<td>303</td>
<td>269</td>
<td>291</td>
</tr>
</tbody>
</table>

---

In Set 2 and 3 Channel B also emerged as superior, which leads us to the conclusion that, for this set of tests, Channel B (oral presentation and written recall) gave a more accurate account of ideas in the transmission process.

2. Next in accuracy in Set 4 was Channel D (written presentation and written recall) and this also agreed with results from Sets 2 and 3. It was not expected that oral presentation would be superior to written but these results lead to that conclusion.

3. Since visual presentation did not make Channel C (written-oral) to be superior to Channel A, yet this was the result in Set 4 as in Set 2. Set 3 gave what was expected and Channel C emerged as inferior. Examination of individual results gave no explanation for this particular difference.

4. Set 4 agreed with Sets 2 and 3 in placing Channel A as the least efficient in transmitting the passages. In Set 4 this represents 49 ideas less, or more than one idea per subject less than for Channel B.

FREQUENCY OF RECALL.

Closer examination of the frequency with which each idea was recalled, through each Channel shows the following:-
1. Some items were almost always recalled through all channels e.g. "Jane had planned to go to see the procession" in Material b. This is a most important idea in the total context.

2. One idea was recalled not more than once through any channel. It was "until the afternoon began" in Material b. Most subjects did not attach any importance to it. These two points would tend to confirm the findings in Sets 2 and 3 that considered importance of the ideas was very powerful in deciding possibility of recall.

3. A few ideas were apparently more easily recalled in written replies. "He might catch a cold" in Material c was one of these.

4. Some ideas were more difficult to recall through Channel A. In Material a. "John wanted to grow some good cabbages" and in Material d "she will be able to buy the shoes" are examples.

5. As was to be expected after seeing the totals set out above, most ideas were recalled more often through Channel B. It would be difficult to account for variations from this tendency.
Suggested variables could include:
(a) variation in level of attention.
(b) Some individual meaning difficulty through phrasing or vocabulary of the original or comprehension difficulty on the part of the subject.

6. A few ideas were recalled more frequently through Channel A "The weather was fine" and "her cold was not quite better" were two good examples.

7. In many cases, ideas were recalled through every Channel almost the same number of times. "His mother thought he should walk" was recalled by eight subjects through each Channel. This would seem to suggest that most subjects tended to
(a) evaluate these ideas similarly or
(b) find equal ease in recalling them because of the nature of the material rather than the Channel used.
This is in complete agreement with conclusions drawn from Set 2 and 3 results.

An examination of figures for frequency of recall shows two underlying tendencies:
(a) Recall of items was related to their position in the passage.
(b) Interest level or importance attributed to the ideas tended to affect frequency of any position in the passages. e.g. Idea number 11 in Material a. "He hopes to sell some to the corner shop
was among most frequently recalled presumably because it was a main point of the whole passage. Likewise idea 10 in Material c "the other boys were swimming" was also among the most frequent and its interest content for subjects can easily be seen. Generally, ideas which appeared to be of high importance in conveying total meaning tended to be recalled and further analysis of these showed the influence of the subject's considered opinion.

Usually frequency of recall was lowest for items towards the end of the passages although some fourth and fifth items scored poorly obviously because of low interest level. From these points it would seem then that interest level, importance and position in a passage have very great effect upon recall although in these tests the effects tend to be levelled off through numbers of subjects and use of four passages.

OMISSIONS.

Ideas most frequently omitted were as follows:— Material a. "They are ready in time".

b. "The afternoon began".

c. "She has saved some more".

d. "It was too late to enter the races".

These could not be considered essential to the sense of the passage and only the one in Material d
would appear to have any real importance. This could explain why another idea "He was not to become sick again" had a similar number of omissions. Further examination showed that frequency of omission was very closely related to importance of the idea to the sense of the whole theme. In this respect it agreed with Sets 2 and 3 also.

Although the omissions could not be classified as unrelated material, they are similar in type to those omitted during Bartlett's experiments. In his stories, unrelated material was liable to be omitted at once and showed the need for a setting or ground. Comparing both the present and Bartlett's findings it would appear that the subjects make assessments of the items so that considered relative importance is the deciding factor.

ORDER OF RECALL OF IDEAS.

Changes in order of recall were difficult to interpret since tendencies were hardly pronounced enough to be significant. One item in Material b. ("The weather report promised an improvement") was wrongly placed by seven of eight subjects who recalled it in one group. Here it would seem that this was encouraged by the order of the ideas but this tendency was not shown by any other group with this material.

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Total numbers of reversals for (i) the channels, (ii) groups and (iii) materials were:

<table>
<thead>
<tr>
<th>(i) CHANNELS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals</td>
<td>29</td>
<td>36</td>
<td>41</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(ii) GROUPS</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals</td>
<td>35</td>
<td>26</td>
<td>27</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(iii) MATERIALS</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals</td>
<td>32</td>
<td>31</td>
<td>36</td>
<td>39</td>
</tr>
</tbody>
</table>

From a study of these figures the following points emerge:

a. Channel used for transmission has an effect. Channel D would seem to be superior.

b. Subjects appear to have different characteristics in this respect. One subject had only one in four tests but another subject had eight reversals. Group 2 seems to be much less likely to reverse ideas than other groups.

c. Idea organisation, vocabulary, theme and idea content seem to exert an influence. Variations from current usage of language would appear to tend back to that form most experienced by the subjects.
Some ideas, or their wording do not seem to have the characteristic which leads the subject into the next idea, hence any one is likely to follow e.g. "He hoed the ground up" in Material a. was followed by three different wrong ideas. Two particular phrases favoured reversal - "his father came to help him (because) he was taking so long" (5 reversals). Most frequently reversed (9 times) was, "he read a library book (while) the other boys were swimming".

d. Most of the displacements of ideas could be attributed to the change in logical structure made by the subjects rather than a simple reversal of ideas. This point however will be discussed later.

RECALL OF KEY WORDS.

Loss of key words through the transmission process was even greater than loss of ideas. In Set 4 only 15 per cent survived out of a possible 1728 recalls. Relationships between the ideas were (a) Lost completely.

(b) replaced by an incorrect word or
(c) replaced by a different word of the same meaning.

There were 111 cases of the latter. If these are included in those for correct recall, the percentage is raised to 21.4.
SCORES FOR KEY WORDS RECALLED IN
SET FOUR REPLIES.

TABLE XIV.

<table>
<thead>
<tr>
<th>Channel</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Group Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.1.</td>
<td>11</td>
<td>17</td>
<td>25</td>
<td>18</td>
<td>71</td>
</tr>
<tr>
<td>G.2.</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>25</td>
<td>66</td>
</tr>
<tr>
<td>G.3.</td>
<td>16</td>
<td>12</td>
<td>5</td>
<td>21</td>
<td>54</td>
</tr>
<tr>
<td>G.4.</td>
<td>16</td>
<td>28</td>
<td>19</td>
<td>12</td>
<td>75</td>
</tr>
<tr>
<td>Totals.</td>
<td>56</td>
<td>71</td>
<td>63</td>
<td>76</td>
<td>266</td>
</tr>
</tbody>
</table>

Compared with these figures Set 2 replies contained 24.7 per cent of possible and Set 3 29.2 per cent of possible key words. The lower figures for Set 4 can be accounted for by the greater complexity of the original material and the more involved dependent ideas. However, the following points should aid in the interpretation of the comparative figures with ideas recalled.

1. In set 4, Channel D gave greatest recall of key words. This agrees with Set 2 but not with Set 3 where Channel B was superior in this respect. These results are unexpected when we recall that Channel D did not give greatest recall of ideas in Sets 2 and 4. It suggests that written presentation tended to impress key words more than oral presentation although Set 3 does not reinforce this idea.
2. Sets 2 and 4 placed Channel B next in order in accuracy of recall of key words. This was followed by Channel C and finally Channel A. Set 3 however, placed Channel A before Channel C.

3. In many cases large numbers of new key words were introduced into recalled versions. In the three Sets, Channel C appeared to introduce most, followed by Channels A, B and D in that order. The numbers of incorrect, introduced key words grew as the correct ones diminished.

4. Although correct key words were frequently used and others introduced, they were not given in the complex structure of the original materials. Subjects almost invariably reduced relationships to a time sequence using key words as links.

TENDENCIES SHOWN IN KEY WORD RECALLS.

Key word recall showed a number of trends of which the following are the most pronounced:

1. Material c. seemed to lend itself to the greatest number of recalls of key words, while Material a. gave fewest correct recalls.
2. Group 4 appeared to be much more reliable than Group 3 in this respect.

3. Key words used incorrectly consisted of a wide variety which included all of the originals except "therefore".

4. Subjects showed a tendency to use a wider variety of key words using Channel B.

5. "Then" was used much more frequently in Channel C than in any other.

6. Both "to" and "for" were used most frequently in Channel D.

7. Most commonly used key word was "and". Figures for this word show marked trends and are set out below.

**SCORES FOR USE OF 'AND' IN SET FOUR REPLIES.**

**TABLE XV.**

<table>
<thead>
<tr>
<th>CHANNEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP 1</td>
<td>MATERIAL</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38</td>
<td>10</td>
<td>31</td>
<td>8</td>
</tr>
<tr>
<td>GROUP 2</td>
<td>MATERIAL</td>
<td>d</td>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33</td>
<td>7</td>
<td>31</td>
<td>8</td>
</tr>
<tr>
<td>GROUP 3</td>
<td>MATERIAL</td>
<td>c</td>
<td>d</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td></td>
<td>31</td>
<td>4</td>
<td>44</td>
<td>12</td>
</tr>
<tr>
<td>GROUP 4</td>
<td>MATERIAL</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33</td>
<td>18</td>
<td>34</td>
<td>6</td>
</tr>
<tr>
<td>TOTALS</td>
<td></td>
<td>140</td>
<td>39</td>
<td>140</td>
<td>34</td>
</tr>
</tbody>
</table>
Material a. 95  
    b. 91  
    c. 83  
    d. 79

These show the similarity of the groups in habit of using "and" as well as the close similarity of the passages in suggesting use of the words.

Totals for the Channels show:-

a. Clear superiority of written recall in preserving structure of material as measured by the number of "and"s used.

b. Strength of the tendency to fall back upon use of "and" as a link between ideas.

3. The following key words were often used and are set out in order of frequency. because, but, so, if, when, that.

   Totals for these words did not vary much from one channel to another but small group variations occurred showing that some subjects were more prone to use particular key words through a particular channel.

9. Numbers and varieties of new key words used in each channel depended to a large extend upon the complexity of structure attempted in the reply and so the degree of accuracy in recalling correct information. So we find that Channel B. with the most correct ideas and second
highest number of correct key words used also gives the widest variety of new key words. Channel D, which produced the second highest figures of correct ideas and highest number of correct key words, also produced a wide variety of new key words.

Use of particular key words would appear therefore to depend upon complexity of the information being coded as well as language habits, vocabulary of the subject and to a certain extent the structure and wording of the original passage.

Comparing Set 4 key word results with Set 2 and 3 we find that Set 2 agrees completely in placing of the Channels for reliability of recalling key words. Set 3 shows slight variation in that Channel B produced more correct words followed by Channel D, Channel A and Channel C. This comparison, together with the 'idea recall' figures give the impression that Set 3 must have contained certain elements responsible for the different results. Channel C gave most introduced key words followed by Channels A, B and D. All test results are similar in indicating greater reliability where written recall was involved.

All tests showed that 'and' was used much more frequently in oral than in written replies. This reflects the different structures of the replies but this will be considered later.
As in previous sets, individual subjects showed strong habit tendencies towards using particular key words. One subject for instance, used eight "and"s in one test with only one other key word, while another used no "and"s at all in a test.

Some subjects used a wider variety of key words than others. These points tend to confirm the theory that language is a strong force in helping to mould ideas, as proposed by Whorf\(^3\).

KEY WORD COMPREHENSION.

Replies were then examined for comprehension of key words, measured by their use in relating ideas. Three types of recall were distinguished.

1. Where a key word was fully comprehended and recalled in such a way as to express the original relationships correctly.

2. A new key word used which conveyed the original relationship correctly showing that correct comprehension was present but exact words were not used in recall.

3. Where relationship was lost being either expressed incorrectly or not attempted.

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In examining comprehension of key words, the second type of recall was included in the first since correct comprehension took place in both cases. Use of a similar word could be accepted as evidence of fuller comprehension because the subject has been able to introduce a new word yet retain the correct relationship.

Since ideas were apparently affected by position in the passage, as well as the channel used, it could be expected that key words might show similar effects, so three key words were chosen:

a. 'Although near the beginning,
b. 'while' in the centre and
c. 'unless' at the end of Material a.

and the fate of these followed through the different channels. "Although" survived best through Channel D, "while" through Channel B and "unless" through Channel A. Figures were low however and did not vary much so that they could hardly be accepted as being indicative of any positive tendency. Totals through all channels however, show the following results:

**Although** - 14  **While** - 4  **Unless** - 21

It is obvious that the placing of the words directly affected their comprehension and recall but difficult to see why "unless" at the end of
the material should have greatest number of recalls. Failure to recall "while" seems to agree with the general tendency noted with Sets 2 and 3 as well as 4, to recall first and last items best. However, other variables influence these results. The most obvious are:

1. Considered importance of the two ideas being related. If the ideas are considered to be unimportant then recall is more unlikely, which seems to extend Vernon's findings beyond ideas to relationships.

2. Complexity of the relationships involved in that particular key word. Perhaps the complete dependence of the sale of the cabbages upon their size as expressed by "unless" impressed the relationships more firmly than in the case of "although" which is much less definite. There are however, probably more intangible reasons than these.

The most impressive fact is the number of subjects who completely lost the relationships. It suggests that subjects at this age level do not really have the ability to grasp the relationships,

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except in a few cases, and draws attention to the findings of Piaget as they could be applied to levels of difficulty in the relationships set up by key words, but this is beyond the scope of this investigation. Suffice to say that our present knowledge of this aspect of communication has not yet examined the question as deeply as is possible.

**ABILITY TO APPREHEND AND RECALL TWO OR MORE CONSECUTIVE IDEAS CORRECTLY.**

In comparing effect of channels upon ability to apprehend and recall two or more ideas correctly with their key word, Channel D emerged as easily superior with 64 cases, as against Channel B with 45, Channel C with 38 and Channel A with 29. Visual presentation and written recall thus proved superior in this respect.

There was a tendency for subjects to display individual ability and one subject in Group 1 using Material b through Channel B recalled 10 ideas and 7 key words correctly but no one else approached this. The groups showed similar ability, in that their scores were very close, but it would

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appear that organisation of the material has a powerful effect since totals for the materials varied considerably.

Material a. 20, b. 42. c. 66. d. 24.

Considering omitted and recalled ideas, as set out above, it is most probable that

a. Importance of the ideas and

b. their placing with regard to each other, had an effect upon recall of numbers of ideas in correct sequence

Verification of this however, calls for different types of tests. Figures for more than two ideas recalled in correct sequence are very low but tend to show that oral presentation and oral recall (Channel A) has much lower efficiency than any of the other channels.

SUMMARY.

Results from this set of tests clearly show the superiority of written recall in transmitting information as measured by ideas and key words. They also indicate that written presentation of material tends to improve accuracy of recall. Oral presentation and written recall of material emerges as the most efficient channel closely followed by
written presentation and written recall. Oral presentation and oral recall appear to be least reliable measured in terms of ideas, key words and correct consecutive combinations of ideas. Most notable is the breakdown of relationships between ideas into simpler forms or their complete loss.
CHAPTER X.

ERRORS, INSERTIONS AND COMPARISON WITH SET TWO AND THREE RESULTS.

Errors throughout all replies through the four channels fell generally into thirteen groups or types. These were not homogenous but were usually clustered around a particular type of error. Classification proved extremely difficult in many cases for two reasons.

a. It was difficult to follow the subject's train of thought to decide what caused or directed the errors. In five cases no reasonable explanation could be found from the context of the reply. e.g. "There was a brown one" added to Material d.

b. There appeared to be no clear dividing line between some of the error types. When ideas had been carried beyond the original until errors crept in they were very similar to statements made in replies where the idea was merely implied in the original, correctly interpreted and put into words by the subjects. This will become more obvious as the various types are described.

1. Carrying or developing of an idea further than stated in the original until new erroneous ideas, were introduced into replies.
FREQUENCY Score  
A  B  C  D  Total.
41  22  16  14  93

An example of this from Material a was the case in which "he couldn't get it done" was added to "he found the ground very hard to dig". From the figures above it would seem that as written language entered into the transmission process, frequency of this error diminished.

This is similar to the first type of error found in Set 2 and Set 3 as well.

2. Stating in words of an obvious step which was not in the original, in progression of events in the passage. An example from Material d was "her sister told her - "This would obviously have happened but was not part of the original passage. These errors did not affect accuracy as much as the first mentioned, and could really be described as an element of redundancy which tended to make the reply more accurate as noted by Quirk.

It is difficult to find any reason for the low numbers through Channel A unless the tendency to reduce difficulty or complexity led to simple connecting links being used rather than implied steps being introduced. The tendency to take a more objective view of the passage noted in previous Sets could account for the greater frequency of this error through the other Channels when there was more time for thought development. It is similar to Spearman's\(^2\) anticipatory or simultaneous influences.

This type of error was very infrequent in Set 2 and not noted at all in Set 3 so that type and complexity of material would seem to bring it to the fore.

3. Introducing erroneous ideas to complete the sense of replies when subjects realised that they were deviating from the correct version.

\[
\begin{array}{cccccc}
\text{FREQUENCY} & A & B & C & D & \text{Total} \\
\text{SCORE} & 13 & 4 & 11 & 20 & 48 \\
\end{array}
\]

In one extreme case, through Channel D, eight new ideas appeared with one correct one placed among them. Using Material a. the subject's first error was in trying to buy the cabbages from the shopkeeper instead of sell them to him and the rest of the errors followed. Considering this type of error, Channel B emerges as clearly superior to the others. This is very similar to errors due to mental persistence noted by Spearman as he quoted Wundt:

"Every preceding idea tends to alter a following one in like direction."

Sets 2 and 3 gave only two example of this type of error.

4. Summarising of part of whole of the story.
   A typical example was "It was about John".

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As these figures show, there is a marked difference between oral and written recall. Although the statements were not essentially wrong, they did not occur in original passages. It is fairly obvious

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Ibid.
too, that this type of error arises from a desire or attempt to simplify the problem of recall noted by Zipf. In giving oral replies, subjects were apparently mindful of most of the information and tried to clarify it or reduce it to a simpler form. Both Sets 2 and 3 produced similar errors which appear to be a feature of oral recall. Changes in the title of Set 3 passage (See 'Errors' in Chapt VIII) could also be included in this category.

5 Errors in this group varied from a combination of ideas to give a new one, to an alteration made to an idea because of another statement somewhere else in the passage. Here contiguity and similarity seem to be the gestalt figures that exert influences.

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e.g. "In the holidays her father wants to take her camping." This was set out as two entirely separate ideas in the original with a somewhat different meaning. Perhaps these are examples of subjects

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altering the passages or ideas to make them more familiar. (McGeogh & Irion)\(^5\) Three points may be noted:

a. Construction of the passage and type of ideas included have a direct effect upon frequency e.g. similar ideas, as well as contradictory ones\(^6\).

b. It was expected that this characteristic of the passages would balance out, since all were transmitted through all channels.

c. Channels A and C. emerge as much more likely to produce this error, obviously because they involved oral recall.

Among possible reasons for occurrence of this error could be:

1. Visual presentation gave an impression of a large number of ideas which were difficult to reduce to oral language, hence a precis was used.

2. Flow of ideas did not give time for analysis or planning of relationships so that ideas tended to be mixed into a general impression of the theme.

3. Frequency of the error depends upon ability


to hold related ideas in mind and to express them without confusion. This was a fairly frequent error in Set 3 and was present also in Set 2 replies.

6. Change in meaning arising from an alteration in structure of the idea. e.g. "the shopkeeper didn't want them because they were too small". Here the reconstruction has altered the meaning although the subject has correctly understood the original.

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<td>9</td>
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It would appear that Channel D has benefited from the more objective and impersonal approach in that fewer reconstructions have taken place. Use of oral language as in Channel A, B and C, is apparently conducive to this type of error because the loss of structural complexity noted in oral replies leads to these changed meanings. This is only a tentative explanation however. The nearest similar error in Set 2 is the confusion of meaning in the statement, and no errors of this type appeared in Set 2.

7. Reversals of the original statements. McGeogh & Irion7 found similar errors in

serial reproduction where opinions and conclusions were often changed to opposite meanings. A few of these would appear to have arisen because the subject was guided into his error through the particular form of reconstruction given to ideas expressed previously. Spontaneous use of a word not carrying the exact meaning led to changes to correct the situation.

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An example was "the shopkeeper didn't want them" whereas the original said he had agreed to take them. In this case the "unless they are too small" has interfered with expression of the previous idea. Both Sets 2 and 3 produced examples of this error.

3. Wrong reasons given for some of the ideas correctly recalled. "And he wasn't allowed to buy them because I think it was too wet", from Material d is a good example of this type of error. Here the real reason has been lost. The subject recalled that there was a reason so one was invented.

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Differences in figures do not show any marked tendencies but particular passages do show trends. Through Channels B and D for example, Material c produced 3 out of 12 of these errors. Apparently the logic or obscurity of the reasons in the passage influenced recall more than the Channel used. Set 2 gave examples of this but none were found in Set 3 possibly because the theme did not lend itself to this type of error.

9. Wrong interpretation given to the original passage. These proved difficult to classify since there could be a number of reasons for them and difficulties in coding replies could have incorporated wrong meanings. A typical example was "Father has shifted to the country".

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No further examination would seem to be profitable since these errors occurred without apparent reason. No evidence for this type was found in Set 2 replies but Set 3 gave a few examples some of which were difficult to classify because their origin was not clear in the reply.
Limiting factors upon perception noted by Combs are also relevant here, but the design of the tests does not give suitable data for comparison. That there are differences in individual perceptions through the different channels is clear from the reactions to oral and visual presentation of test material but their exact influence does not appear in these results. Four other types of errors occurred in small numbers:

10. Completely new ideas invented without any apparent reason. Of the five cases, three were produced by G.I. using Material d and Channel D.

11. Four errors occurred where subjects put in a phrase or idea apparently to reinforce the sequence of ideas, "And when he had planted them" is an example. This could also be classed as a redundancy. Two each were produced through Channels A and B which suggests that they may be connected with oral presentation, but the numbers are not large enough to be significant.

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3 Combs, W.A. "Intelligence from a Perceptual Point of View". *Journal of Abnormal Psychology*. 47, p.662-673.
12. Two subjects gave wrong identities using Material a. e.g. "his father hoed the ground".

13. One subject gave evidence of retroactive inhibition effects from previous passages. He put ideas into Material b, that were obviously connected with Material a. "It was going to pass the shop which was down the road on the corner" came from Material a, but he placed it with Material b. More cases were expected since all tests were taken over a period of five days.

ERRORS COMMON TO ALL SETS OF TESTS.

Comparing these error groups with Set 2 and 3 results, we find that common types of errors were:

1. Extension of ideas to include errors or ideas not in the original. Set 2. 14 Set 3. 20
   Set 4. 93

2. Summarising all or part of the passage.
   Set 2. 4 Set 3. 4 Set 4. 36.

3. Confusion of meaning from wrong interpretation of original.
   Set 2. 5 Set 3. 7 Set 4. 14.

4. Reversal of original ideas.
   Set 2. 2 Set 3. 4 Set 4. 25.
5. Confusion of two or more ideas.
   Set 2. 0  Set 3. 9  Set 4. 30.

6. Sentences completed with erroneous ideas.
   Set 2. 2  Set 3. 1  Set 4. 43.

From these comparisons it can be seen that similar types of errors occurred throughout all the tests. Apart from a few cases, characteristics such as complexity, similarity of ideas, length and theme, of original passage as well as language characteristics of the speakers had more influence on the errors than the channel used. Sets 2 and 3 errors tend to reinforce these conclusions. The greater numbers for Set 4 were expected because of the increased difficulty of material. Nevertheless the analysis of errors is of value in giving some idea of what happened to the information and what kinds of errors are likely to enter into recalled versions.

ASPECTS COMMON TO ERRORS IN ALL SETS.

From reading replies in these lists a few common features can be found that did not appear in numerical results.

1. Even the most accurate reply through any channel in no way approached absolute accuracy and contained many errors when examined in detail.
This suggests the inadequacy of language to convey ideas and leads to a further question. If words or language forms are so inaccurate, how can we manage to convey meanings as accurately as is done in everyday language processes? The answer to this would seem to be involved in a second feature of replies examined.

2. Interpretations given to the original and structure of replies are much more individualistic in character than would appear at first reading. Every passage was given 36 different interpretations in which the total meaning was very similar but details varied considerably.

This individualistic interpretation creates special difficulties and is further complicated by a further interpretation by the investigator whose mental image is peculiar to himself. Cherry draws attention to this external observer and defines the language being studied as object language while that used to describe rules and laws of language he designates as meta-language. Although these divisions assist, they do not remove the fundamental problem.

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As has been said, we are prisoners in our own minds, i.e. we can never be sure of exact accuracy in our own interpretation of a message and likewise find difficulty in knowing how others interpret the same message. If this was all that affected language, then human communication would break down but a further common factor shows itself.

3. In spite of all small language inaccuracies, subjects almost always recalled the main points of the passages and so total meaning was transmitted.

Evaluation of the importance of separate ideas in relation to the main theme makes yet another subjective judgement necessary. While agreeing with Cherry\(^\text{10}\) that we cannot say what are the bare bones of the message - what parts can be omitted before main elements are not transmitted, we still become generally aware of the total message and are assisted by making comparisons from previous experience. Since however, language itself proved to be so inaccurate, much of this meaning must be applied to the passage by the receiver, and in this case the investigator. As Morris\(^\text{11}\)

\(^{10}\) Ibid.

"Meaning is perceived in the eye of the beholder".
This aspect of interpretation seems to be closely related to language variability of response, experience and range of meaning available to the subject. For instance in Material d. replies to "her sister will lend her some more" suggests that each subject had different ideas about it. Some made a point of returning the money, while others showed doubt by saying "her sister might lend her money". While these instances help to strengthen the second point they also show that, although expressed in different ways, all that is involved in borrowing and lending could be deduced by the receiver or interpreter from both the context and detail of the replies. Taken from its context, the detail tends to lose the common meaning, in that choices open to a receiver are so many because of the absence of other ideas which help to give a location to the story.

There were many other replies that could be used to illustrate the second and third points mentioned above. This again suggests the unwitting selection of central facts noted by Bartlett12 as well as the pieces dropped out to

make replies less disconnected. Subjects here appear to have omitted those sections not fully seen in relation to the total theme.

4. Individual style of language construction tended to persist through all channels, whether the statements were correct or not. The first subject in G.1. maintained a steady, logical attack upon the material with every point fitting into its appropriate place. The fourth subject in this group however, gave accounts that contained what were really short sentences strung together with "and" as well as numbers of deduced ideas interspersed throughout the replies. One subject made a habit of trying to express an idea in a number of ways. "He was sowing, planting, getting ready for sowing cabbages" is a typical example.

5. Reading of original passages, as well as replies, shows the presence of redundancy but it is difficult to analyse how it operates in helping to accurately convey the message. J.D. Brown explains

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redundancy as a trace being "established with more features than are necessary to represent the information which the trace is required to store". From this it can be seen that certain words and phrases, besides being included in the original, can be implied from their context as well as the total meaning of the passage. Reorganisation or loss of some units of the message does not therefore destroy the total meaning which can usually be deduced or reconstructed from those units surviving.

Shannon & Weaver\(^\text{14}\) considered that an element of redundancy could be found in every message as an aid to overcoming noise and improving the efficiency of the communication process. At first glance this does not appear to apply to psychological aspects of communication processes unless we concern ourselves with speed and exactness of meaning. Telegraphic communication tends to eliminate redundancy in interests of economy of money, time and effort but this too can lead to errors. However much redundancy in the passage contributed to its recall, as in the physiological field, much pathological tissue can be present

without the death of the living body and likewise
many errors may be present without loss of the
basic information.

6. The breakdown in relationships in oral
language through Channels A and C would
seem to point to difficulties in oral
expression of relationships rather than
lack of comprehension since the written
replies contained many interrelated ideas.

7. Three further aspects of Spearman's \(^{15}\)
"Analysis of Error" appear to add
something to the above points.

a. The part played by conation and affection.
Personal attitudes, feelings and hopes are
underlying tendencies that have influenced
subjects, e.g. Few girls would fail to be
affected by the suggestion of buying new
shoes in Material d.

b. The transfer of belief that takes place from correct
to erroneous ideas. Each subject believes
most of his erroneous idea to be correct and

\[^{15}\text{Spearman. Op. Cit.}\]
has, at some point, transferred belief.

c. The relation between displacer and displacee. Somewhere in the subject's mind there is a perceived relationship not in the original material. The one example given of an idea being transferred from Material a. to Material b. is an example of this process.

These three factors are more remote causes of error that do not fall into simple categories.

SUMMARY.

Taking errors and insertions from all tests into account, basic causes of inaccuracies appeared to be:

1. The nature of the material.
   a. Relative importance of ideas to total theme.
   b. Sequence of ideas and the relationships between them.
   c. Organisation of material and its relationship to language style familiar to the subjects.
   d. Complexity of sentence construction.

2. Language experiences of the subject.
   a. Level of language comprehension and usage.
   b. Ability to grasp and retain relationships.
c. Recent experiences.

Although there were many losses and inaccuracies in transmission, the main theme persisted and was expressed in unique form by each subject. Persistence of theme appears to be aided by redundancy and total context and underlying influences such as feelings, transfer of belief and relationship between the correct and incorrect ideas tend to further reduce accuracy. We are reminded of Hildreth's conclusion which seems to sum up much of this chapter:

"It is a common tendency to interpret what we hear in terms of what we know or what we wish to hear".

In this case we could extend the statement to include what is read and written as well.

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CHARACTERISTICS RELATED TO THE CHANNELS.

So far the study has concerned itself with numerical results and their interpretation, as well as assessment of superiority and tendencies resulting from the use of different channels. These aspects however, do not include total meaning, conclusions drawn, organisational pattern and alterations in relationships between ideas that may have taken place in transmission.

Conclusions from key word results, as set out previously, point to reaction to total meaning and expression of ideas recalled in language fitted to the organisational pattern in the mind of the subject. With these points in mind, replies were examined in their channels in an endeavour to identify characteristics that could be attributed to these channels. Generally they were divided into grammatical and those related to organisation and total meaning, as well as style of language including fluency and continuity of ideas. Because of standardisation difficulties, features of each channel were dealt with in order of importance, although similarities were also noted.
For similar reasons only subjective descriptions were possible. There are many internal variables which must be allowed for as pointed out by Morris. He distinguishes situational, linguistic and behaviour meaning which he applies to communication situations. No standards have yet been set up with which to compare results, because of the nebulous character of meaning, hence observations tend to be specific and subjective.

CHANNEL A.

1. It was common for subjects to use disjointed phrases in a sentence as though stumbling over the ideas and following intraverbal connections - a choice of one word leading to choice of another, as noted by Osgood when considering his four causes of speech e.g. "unless he, if he". All subjects did this at least once. Cherry observed this same feature and decided that speech was loosely structured -

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"moment by moment conversation is fragmentary, freely breaking all rules of syntax and grammar".

This example is also an endorsement of Skinner's\(^4\) view in which he interprets a large part of verbal behaviour as a speaker's response to his own prior verbal behaviour. Hence we have the stammered amended verbal construction.

2. Almost always, phrases like "was not too late" were shortened to "wasn't too late". Similarly, "we would", became "We'd" and "could not", "couldn't". All subjects did this at least once, which again calls Zipf's "Principle of Least Effort" to mind.

3. There were numbers of phrases and words used that do not commonly occur in written language. Such phrases as "in case", "he had to", "would rather him walk", "bike" and "cause" are examples of this. We are reminded of similar findings by Quirk\(^5\).


4. Use of the word "well". This was commonly used and defies interpretation other than being an "intimacy signal". It could be used to provide a pause during which the subject had time to arrange ideas for expression.

5. Almost all subjects formed a continuous sequence of the ideas in one long sentence. We would expect something similar to this since Quirk\(^6\) noted the same continuity and concluded that sentences and paragraphs are not divisions of living speech. Apparently oral language is least affected by grammatical and syntactical rules because of its spontaneous character and piece by piece construction. Smoothness and effectiveness in spontaneous speech was also noted by French\(^7\).

\(^6\) Ibid.

6. Subjects were frequently confronted with difficulties where simple conjunctions like "and" did not correctly express the relationships between ideas. It was in these situations that they paused and resorted to disjointed phrases e.g. "and he would go he could stay and then he could swim". To some extent this illustrates the pragmatic character of language set out by Ogden & Richards\(^3\) since the speaker is making adjustments to the immediate situation and giving expression to changing mental images.

7. Some subjects gave evidence of feedback in that correct statements led them to think back and correct them e.g. "and if the sports the school swimming sports - " . This recalls Wiener's\(^9\) experiments and raises the possibility of further enquiry into this type of feedback which is obviously more extensive than at first thought. Studies by Grant Fairbanks Seminar\(^10\) showed this to

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be greatest in oral speech, but we must not lose sight of possible feedback effects even in written language.

3. There were numbers of occasions where mention of one subject or item reminded the subject of another as Bartlett \textsuperscript{11} found in his tests. Thus we have a subject saying "and her mother decided to let her go and she got on the bus". Here the conclusion that if she went she would probably travel on the bus seems inescapable.

The above features tended to give Channel A replies a style of their own marked by hesitancy, colloquial forms of speech and continuous flow of ideas that were not always logically related to each other. These characteristics completely agree with those noted by Quirk \textsuperscript{12} except for the changes he noticed in form order. In these tests it was rather a case of recasting the whole theme so that forms of language familiar to the subject could be used to express the ideas.


\textsuperscript{12} Quirk. Op. Cit.
1. In contrast to Channel A almost all replies in Channel B were set out in continuous and logical form without any sudden jumps or new ideas. Organisation of ideas showed planning and a confident approach to the material.

2. Only one subject used an apostrophe to join words like 'were not' and this was done twice by the same subject. All others wrote out the full forms which tended to give the replies an artificial or stilted character.

3. Only two examples of colloquialism such as "in case" were found. Words appeared to be more carefully chosen suggesting that subjects used a slightly different vocabulary in encoding replies.

4. There were no apparently unnecessary words like "well" so that all words were given a function.

5. Numbers of sentences were used in every case. These varied from short, complete statements to more complex sentences containing three and occasionally four related ideas. Generally the structure of these was much more complex than in Channel A although subjects of lower
ability gave simpler structures with frequent use of 'and'. In this way, subjects of lower I.Q. tended to produce similar structures to Channel A subjects. Many used full stops to break up in an artificial way ideas which they had really connected by using key words. This characteristic raises the same question as mentioned in the Seminar\textsuperscript{13}.

"Does grammatical structure influence the thinking of those who speak it?"

Comparing Channels A and B greatest influence of grammar appeared in written language replies.

6. There were no cases where organisational patterns broke down, probably because subjects could easily revise previous ideas. This also shows that general meaning was always obtained.

7. If feedback took place, these replies do not produce any evidence for it.

In contrast to Channel A, these aspects from Channel B replies tended to give a more formal tone and stilted style to the language organisation.

\textsuperscript{13} Osgood and Sebeok. Op. Cit.
Sentence structures would appear to have been imposed upon thought processes with varying results in structural complexity of replies. More able subjects, or perhaps those with greater language experience, used sentence forms efficiently and even obtained benefits through being able to clarify their ideas more easily while those of lesser language ability made faulty use of sentence structures and organisational patterns tended to break down to the simpler structures found in Channel A replies.

**CHANNEL C.**

Replies through this channel tended to be very similar to those through Channel A, which we would expect to be the case. There were however, a few differences that altered the impression conveyed by the language structures used.

1. Generally, a more complex pattern was given to ideas and more sentences were used. Many subjects gave all ideas in one long sentence, but effects of reading the passage were evident in attempts to divide many replies into sentences.

2. Subjects of higher ability gave more complex sentence structures that were similar to those
noted in Channel B replies.

3. There were a few breaks in continuity of ideas but generally a continuous flow of ideas was maintained.

4. Although colloquial terms like "bike" were used, they were much more infrequent than through Channel A and most subjects did not use any of these forms.

The general impression conveyed was that of conflict between a basic mental thought plan and artificially imposed language forms which resulted in varying types of replies, depending upon ability or language facility of the subjects. It would appear that this impression and the differences listed above arose from visual presentation of the material which gave a better basis on which to construct replies. Language forms seem to have been more persistent through Channel C whereas in Channel A subjects had to depend more upon their own resources in constructing replies.

CHANNEL D.

Replies through this channel appeared to fall somewhere between Channel B and C in quality of construction and style. They were less homogeneous in character and varied from a single, simply constructed sentence to the more formal
grammatical style of Channel B. The following trends seemed to be the most obvious:

1. Lower ability subjects tended to revert to Channel A style. There were exceptions to this however.

2. Generally a number of sentences was used for each reply but they were fairly simple in construction and did not reach the level found in Channel B replies.

3. A few shortened forms and colloquial expressions like 'wouldn't and 'bike' were used but they were not common.

4. All replies were logically continuous and did not contain any breaks where sentence relationships or patterns had broken down.

Through this channel, subjects gave an impression of uncertainty in that they made many corrections, occasionally rewriting a large section. The finished story however, was always logically complete although not always accurate.

SUMMARY.

Comparing the channels in general, there are factors which stand out in the replies.

1. Sentence structures and other grammatical rules
appear to be artificial and subjects show evidence of experiencing difficulty in moulding their ideas to conform to the rules.

2. Although grammatical rules appear artificial, they also tend to make more complex relationships possible in language constructions thus extending the scope of language communication.

3. Written language, used in either presentation or recall, tended to preserve continuity of ideas and their relationships whereas these were reduced in accuracy in oral transmission. Considering all points, the conclusion of Hildreth\textsuperscript{14} appears to be appropriate –

"When children or adults are confronted with problems too difficult for them to solve, or situations beyond their understanding or experience, they tend to substitute simpler mental processes for the appropriate ones".

All recalls gave evidence of simplification of the material but this was carried much further when oral language entered into the process. Within this common tendency there was a wide range of individual characteristics which merit our attention and so three replies from subjects are examined in the next chapter.

A STUDY OF THREE SUBJECTS.

FIRST SUBJECT, JOHN. (NOTE. SEE APPENDIX B FOR REPLIES).

As an aid to understanding the individual character of replies, those of three subjects were selected, one each from the best, average and lowest performers for comparison. As far as possible, representative replies were chosen.

John, subject No. 1. in G.l. was a patient boy of I.Q.129 and with well developed habits of application and industry. His results through the four tests are set out below.

SCORES FOR JOHN THROUGH ALL SET FOUR TESTS.

<table>
<thead>
<tr>
<th>CHANNEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDEAS</td>
<td>8</td>
<td>13</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>KEY WORDS</td>
<td>3</td>
<td>7</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>NEW IDEAS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>NEW KEY WORDS</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Many of his personal characteristics are reflected in replies and there seems to be a strength in translating oral to written or written to oral.
language. Channel A reply gives an excellent and complete summary of main points which convey accurately, the central theme in spite of the fact that only eight of the ideas are recalled. It would seem that much additional meaning is conveyed in the order of words and ideas. All through, a feeling of confidence is evident as well as a methodical approach. Three of the four errors were really extensions of ideas or elaboration. One error, where 'cabbages' were replaced by 'seeds' at the beginning, was misleading until mention of the 'butterflies' and 'caterpillars' later (really redundancies) helped to narrow down what was planted, although there was still room for doubt. He used 'and' only three times as well as three other new key words. Any idea or incidental information that was lost mainly concerned unessential details and does not appear to have affected total content much.

His reply through Channel B is a very accurate account containing most of the details as well as a highly accurate account of the theme. It lacks the flow or smoothness of Channel A reply but sentences are much more complex with efficient use of key words. Individual characteristics appear
as in Channel A reply but there is a hesitancy and apparent deliberation over the pattern of ideas being expressed. The last two ideas in the passage were omitted, all others being placed in correct sequence.

Channel C reply reached a high level of accuracy in that only one idea was omitted and it was not high in importance. In some ways this was similar to Channel B reply in that sentences had a suggestion of hesitancy resulting from patient planning and there were no shortened forms or colloquial words. Although details are accurate, some key words omitted and new ones introduced gave the reply a slightly simpler structure, but in general the theme was conveyed very accurately.

Channel D reply fell far short of any of the others in that there are more inaccuracies than would appear from the figures. There is an obvious confusion and complexity of sentence relationships in the reply which has broken down to a much simpler version. The style of sentence is a very similar to the reply from Channel A but there is not the same level of performance in total accuracy. Changes in order of words and positions where new ideas have been introduced all seem to help in reducing accuracy of meaning. Nevertheless the main theme survives and much can be added to it
by inference on the part of the interpreter.

All through the replies, this subject maintained a high level in accuracy of transmission, with Channel B and C appearing to be conducive to highest accuracy. From examination of replies the following points appear.

1. Total numbers or percentage of ideas recalled does not always give an accurate idea of how well the message has been transmitted.

2. There seems to be an intangible quality about language, as used in these tests, that conveys more meaning than appears from numerical analysis of ideas and key words. Some of the factors that could be contributing to this are
   a. word order
   b. idea order
   c. complexity of sentence relationships
   d. style of sentences. Hesitancy and feeling of accuracy conveyed in sentences seem to influence thinking of interpreters. Carroll has asked to what extent the sequences themselves, apart from the symbols, carrying meaning but admits that no one has yet answered this question.

---

Further tests would be necessary however, to establish these factors as positive influences since here they are merely subjective deductions.

3. In this case at least, two abilities appear to be involved in the subject's replies.

a. Ability to receive language and to transmit it through the same channel, i.e. oral presentation then oral recall and written presentation then written recall.

b. Ability to translate oral language into written language and vice versa.

4. Numbers of key words correctly recalled would seem to bear a relationship to complexity and accuracy of meaning.

5. The patient, and generally methodical style of this subject is reflected in the planning and accuracy of all his replies. In this he confirms the idea of Sandford who said that descriptions of a subject's speech resembled his personality in many ways.

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SECOND SUBJECT, RALPH.

The next subject, Ralph, who was No. 5 in G.4. appeared to fall about the middle of the group in ability, having an I.Q. of 108 and producing average results in the tests. This subject was inclined to be impulsive and did not usually apply himself to tasks for any great length of time. Numerical results are set out below.

SCORES FOR RALPH THROUGH ALL SET FOUR TESTS.

TABLE XVII.

<table>
<thead>
<tr>
<th>CHANNEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDEAS</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>11</td>
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<tr>
<td>KEY WORDS</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>NEW IDEAS</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>NEW KEY WORDS</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

Through Channel A, he gave a disjointed summary of most of the main points although few positive relationships between sentences were expressed. There was a lack of smoothness in the sentences with unnecessary repetitions of words. He appeared to be unsure of how to express the ideas and did not have
any real pattern or plan but recalled ideas as they occurred to him. This style of presentation appears to confirm the second point stated above appearing from the first subject's replies.

Organisation and abrupt style of the sentences do not lend themselves to assumptions or influences from ideas recalled. One could assume that, since the subject is not certain of the ideas or their relationships, it is unsafe and probably inaccurate to carry the ideas in the material any further. From the above observations it is apparent that this subject (a) either experienced difficulty in decoding the passage as he received it or (b) if the passage was accurately received, experienced difficulty in encoding for recall. Reliable results could not be expected if separation of these abilities were attempted with this tests, so we can safely conclude merely that difficulty was experienced in this channel.

Through Channel B Ralph showed much more fluency in word order and sentence sequence giving an idea of the presence of planned construction in addition to more ideas being recalled. Greater accuracy of theme appears although it tends to break down at the end of the passage. Sentence construction is more complex and positive relationships are included
although they are still a simplification of the original passage. Total meaning appears to be greater with a sense of completeness being conveyed in spite of errors.

Smoothness of construction, sense of completeness and an attempt at planning is even more apparent in Channel C reply. Whereas Channel A reply was disjointed, this one was an almost continuous series of ideas showing a confident and logical approach. Sentence arrangement was similar in complexity to Channel B reply.

Channel D reply tended to fall between Channel A and Channel B. It was inclined to be stilted but was not as abrupt as the reply through Channel A. Sentences usually contained only two ideas and were not as complex as those used in Channel B. It contained more ideas than any of his other replies and could be accepted as the most accurate, although comparison of general construction would tend to place Channel B ahead of it since the latter maintained a better sense of the theme.

From these observations, the following points appear:

1. Channel A would seem to be less accurate for this subject. The fairly steady quality of
replies through other channels would lead to the conclusion that decoding oral language and then encoding it for oral recall is his difficulty.

2. Similarity of style was maintained in both written recalls although there were slight differences. Sentence length and tendency to abruptness are similar to oral recalls through Channels A and C.

3. Style of recall through Channel C would suggest that a much clearer pattern was obtained through written presentation and this would account for superiority of this reply over that through Channel A. The quality of Channel B reply however, would tend to give the impression that the passage was decoded well from oral presentation and this narrows down the weakness specifically to Channel A as noted in the first point.

This subject gave a performance that conformed to the average more closely than the first. Once again there was a tendency for personality characteristics to be reflected in style of language construction used in replies.

THIRD SUBJECT, MARILYN.

Choice of a subject for a study from the lower
end of the ability list was most difficult because scores in most cases were fairly low, yet varied considerably. No. 9, in C.4, appeared to be reasonably representative of those with an I.Q. rating of 84.

This girl was usually quiet and produced results a little below average in school subjects.

SCORES FOR MARILYN THROUGH ALL SET FOUR TESTS.

TABLE XVIII.

<table>
<thead>
<tr>
<th>CHANNEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>IDEAS</td>
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<td>KEY WORDS</td>
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<td>0</td>
</tr>
<tr>
<td>NEW IDEAS</td>
<td>8</td>
<td>8</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>NEW KEY WORDS</td>
<td>9</td>
<td>11</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

Her eleven ideas in Channel A, only three of which were correct, were related by "and" except for the use of "because" once. This is an example of an almost complete breakdown of sentence relationships and the replacement of all but one key word with "and". In spite of these inaccuracies, the most
important areas of meaning were transmitted. There were many omissions and incorrect simplifications so that persistence of the meaning was unexpected. It can only be presumed, as we noted in investigating the first subject, that much depends upon knowledge and experience of the interpreter and the numbers of inferences and deductions he can make from the reply. More specifically, there were numbers of shortened words as well as breaks in flow and continuity of the sentence structure. There was a very short sentence to begin and the rest was one continuous sentence.

Channel B reply appeared to convey almost as much of the total meaning as that from Channel A except that unnecessary repetitions occurred as though the writer was trying to build up the story from the few ideas correctly recalled. Style and structure were very similar to Channel A reply although there were no shortened forms, the style flowed better and an attempt had been made to structure the answer into a logical sentence plan. Many details were omitted and main ideas such as term holidays and swimming races were not mentioned. All the last items tended to be confused or omitted.
Marilyn's reply through Channel C presents a confused and very incomplete total picture although as many ideas were recalled as through Channel B. Many main ideas such as camping in the country, the holidays and borrowing from her sister do not appear. There were numbers of shortened forms as well as disjointed sentences which interrupted flow of the ideas. General meaning conveyed did not approach that of Channels A or B and the style would seem to have been a partial cause of this, coupled with the omission of so many main ideas. Greatest breakdown in accuracy would appear to be written presentation of material since, as seen in Channel A reply, the subject appears capable of encoding ideas in oral language with reasonable accuracy of meaning.

Through Channel D, this subject, after beginning with a correct idea, gave a new series of ideas that appear to have followed naturally from the first error, yet there were four other correct ideas fitted in in various places. The total reply gave a completely erroneous picture of the passage and is very difficult to account for. The most likely cause would appear to be faulty interpretation of the passage read, since it is hardly likely that such a complete change in the theme would arise at the encoding stage in writing the reply. This conclusion is reinforced when we recall performance through Channel C.
which also involved written presentation.

The reply gives an example of how, although the same number of correct ideas were recalled as through Channel A, total meaning can be very much in error. Nevertheless, structure and complexity of sentences was of a much higher order, there being six fairly well constructed sentences in the whole reply. No shortened forms appeared and there was a general style similar to that of all other subjects in this Channel. Forethought and planning were apparent throughout.

Taking all this subject's replies into consideration leads us to the following conclusions.

1. Best general performance was though Channel B where greatest amount of total meaning would appear to have been conveyed.

2. Specific weakness in comprehension of written material has been present since both Channels C and D convey least of the total meaning.

3. The subject has displayed very limited ability to grasp and retain ideas and particular relationships through all Channels and it is reasonable to assume that this is related to ability as measured by the I.Q. test used.

GENERAL CONSIDERATIONS.

From these studies of individuals, the first conclusion that could be drawn is that average
level of performance is related to general ability although, as shown in results of all individuals, this relationship is not invariable. The three subjects chosen for the closer study emphasise differences in ability, but style, method of attack and personality also tend to influence results.

The position is further complicated by the store of verbal habits available to the subject in framing a reply and also by the relationship established between investigator and subject. Cherry\(^3\) in investigating these points, noted the wealth of meaning conveyed in a word between workmates and others whose verbal characteristics were well known to each other. These factors appear to affect replies from subjects through all channels.

As in the previous study of channels, there are observable differences in recall of passages through the different channels.

Results from these three subjects, although there are small discrepancies, tend to agree with conclusions drawn from numerical scores in placing

\[\text{Cherry, Colin.} \quad \textit{On Human Communication}. \quad \text{Wiley and Sons.} \quad 1957.\]
oral presentation and written recall as the channel more conductive to accuracy and reliability with written presentation and recall as a very close second. Oral presentation and recall emerge in almost every case as being least accurate in spite of generally giving most fluency of language in replies. Nevertheless, each subject seems to have one or more channels through which certain strengths appear.

The first subject’s strength through Channels B and C suggests ability in translating oral to written language and vice versa while the second subject followed the usual trend in being strong in writing replies. This suggests he performs much better through this channel possibly because this tends to subdue the impulsiveness shown in oral presentation and recall. Although oral presentation and oral recall gave results almost equal to oral presentation and written recall for the third subject, weakness in interpreting written language is the more obvious reason for low results through channels involving written presentation. These observations help to emphasise the individual character of language performance as well as the difficulty of finding common standards by which performance can be judged.

This difficulty also applies to assessing
complexity in structure of sentences, and the whole reply. The individual studies follow general tendencies towards simplification of both sentences and theme. This is most obvious in oral replies while written replies tend to preserve a sense of relationship. Part of the explanation of this could be in the attempt to impose sentence structure upon continuous thought processes. Conversely, use of sentence structures could be an assistance in encoding relationships. This is an extension of those conclusions of Bofer and his associates who have shown that word associations influenced solving of the Maier "two string" problem, thus illustrating one aspect of the Whorfian hypothesis. Hence we find greater complexity of structure in practically all written replies.

Other factors such as delay in writing replies and facility for checking back to what has been written cannot be neglected, so that other types of tests would be necessary to verify the above observations.


It is also apparent that total meaning cannot be measured by the number of facts or even key words accurately recalled. Replies from the first of the three subjects examined in detail give a good example of how numbers of ideas can be misleading. Many factors seem to be involved but from these investigations, ideas, key words, numbers of ideas correctly related to each other, and general plan of the reply appear to be of most importance. It was noted that subjects who gave best recalls, also gave most pairs of ideas correctly related, yet there were exceptions. As McGeoch & Irion found in their experiments in serial reproduction, each subject tended to work the material into a form which fitted his own motives and criteria of suitability and reasonableness. It was not the immediate material alone which determined recall, but its interaction with motivation and the retained residue of prior learning. Once again, however, these are observations which are only suggested from the facts available in these results.

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CHAPTER XIII.

COMPARISON WITH CLOSELY RELATED STUDIES.

KING'S FINDINGS.

As was suggested earlier in the study, conclusions reached by King would be considered when Set 4 had been analysed. His study was essentially a comparison between reading and listening for comprehension and did not cover such a wide field as the present study therefore comparisons must be restricted to results from these two methods of presentation.

Set 3 results show disagreement with his first conclusion that listening is more effective for immediate recall. Groups 1 and 2 together, given oral presentation, did not recall as many ideas and key words as Group 3 and 4 together who were given the same material visually. Comparison of complexity of sentence structures and total meaning in replies gave a similar result.

There is some evidence in Set 4 results to support this first conclusion (that listening is more effective for immediate recall). Channel B., written replies based on listening, did give the best results in ideas, key words and general organisation and complexity of material in replies but Channel D.,

1 King, Op. Cit.
written replies based on reading, gave very similar results taking the above aspects into consideration. On the other hand, listening did not lead to more accurate oral replies through Channel A, when compared with visual presentation for Channel C oral replies which were clearly superior. From these comparisons we must conclude that King's first conclusion is not supported by this study and in fact, comparing Channels A and C, they tend to disagree with his findings.

His second conclusion, that brightest boys and girls recall facts better when material is read by them, is difficult to compare with any sets of tests in this study since these groups were of balanced ability. Nevertheless, brighter subjects tended to perform more satisfactorily than those of lower ability through all channels, although this was not always so. It must be pointed out however, that in these tests, method of recall had much more influence upon accuracy of recall than did method of presentation, which does not seem to have influenced recall very greatly in any of the sets of tests.

King's third conclusion that "less academically minded children" tend to absorb initially more facts if these are presented orally is not confirmed by these tests. Subjects of lower I.Q. tended to follow the
general pattern and produced most accurate replies through Channels B and D, as did more able subjects.

His fourth conclusion that both methods should be used for reinforcement cannot be compared since each material was transmitted through a different channel to each subject.

His finding of a relationship between ability and facility with listening and reading was well confirmed however, in that, with few exceptions, good listeners were always good readers as judged by all aspects of the results. Subjects performing well with oral presentation always performed well also with visual presentation.

Of interest to the present investigation, are the conclusions of Goldstein as reported by King\(^2\). The conclusions he quotes are as follows:

1. Listening comprehension is, in general, superior to reading comprehension.

2. Listening comprehension is better for easier than difficult materials.

3. Reading comprehension is more variable.

4. More intelligent score higher in both.

5. Equivalent passages for reading comprehension does not ensure their equivalence for listening.

\(^2\)Ibid.
The first of these agrees with King's own findings and the same comparisons apply to this study.

The second conclusion is more applicable however but is complicated by two points:-

1. What criterion is to be used as a measure of difficulty of the material?

2. Is accuracy of recall an acceptable measure of difficulty?

In considering the first point the measure would seem to be highly subjective, as Beighley found in organising his material, and even though the four passages used for tests in Set 4 of this study were compiled to be reasonably similar a definitive attempt was made to assess the inherent difficulty of each. The nearest attempt was a cross check of totals from the four equated groups which showed close equality. Total figures were:-

Material a. 234  b. 278  c. 294  d. 275.

Since the answer to the second question depends upon the accuracy of the answer to the first, results from the present tests cannot be accepted as a measure of difficulty of the material. The differences between group results for each material suggests the actual difficulty of material was different for each group so the conclusion appears to be open to question.
Further investigation does not seem to be profitable with these results and requires different tests.

All sets of tests in this investigation do not support the third conclusion since replies from Channels A and B (oral presentation) together, and replies from Channels C and D together (written presentation) show greater accuracy and less variation among individuals through the latter channels. Channel D alone showed a variation of only 4 ideas in the group totals. Individual replies also showed less variation in numerical totals.

Goldstein's fifth conclusion could be said to have been supported by numerical results of these tests. Totals for listening and reading of the materials by all subjects were always different.

Scores for Comparison of Listening and Reading Difficulty of Passages.

**Table XIX.**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>LISTENING</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>144</td>
<td>140</td>
</tr>
<tr>
<td>b.</td>
<td>146</td>
<td>130</td>
</tr>
<tr>
<td>c.</td>
<td>142</td>
<td>146</td>
</tr>
<tr>
<td>d.</td>
<td>128</td>
<td>141</td>
</tr>
</tbody>
</table>
Thus material d. appears to be more accurately recalled through reading than listening while with material a. the position is reversed. This suggests another variable within the material itself or perhaps the subject although these results are not conclusive.

In view of the points and conclusions in considering Goldstein's third point and their comparisons with the above figures it is apparent that many other factors must be considered in assessing relative difficulty of language materials. Some of these have appeared in previous chapters and will be listed later.

BEIGHLEY'S FINDINGS.

Beighley's investigations are relevant because he studies the same types of communication being investigated in these tests. He was concerned with only oral and visual presentation as was King although his aims were not the same. Beighley was interested in the following questions which are of relevance to this study.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>KEY WORDS</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>25</td>
<td>17</td>
</tr>
<tr>
<td>b.</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>c.</td>
<td>44</td>
<td>50</td>
</tr>
<tr>
<td>d.</td>
<td>25</td>
<td>37</td>
</tr>
</tbody>
</table>
1. Is more information transmitted through visual as against oral presentation?

2. What is the effect of the vocal skill of the reader?

3. How does difficulty of the material affect communication?

4. What is the effect of organisation upon transmission?

Of these questions, 2 and 3 are not important in the present study since

a. The same reader and conditions were present for all oral presentations, and

b. as noted in discussing Goldstein's findings, passages were made as similar as possible and total results suggest that a fairly high degree of similarity was achieved.

Considering the first question, Beighley writes

"In the present experiment, the comprehension gained through seeing, i.e. silent reading, was consistently greater than that gained through hearing."⁴

Comparing this with present results, as far as written replies are concerned, oral presentation gives greater quantity and accuracy than visual presentation although the difference is not great. With oral recall however, visual presentation gives a slight advantage. Putting both comparisons together, it would appear that the reaction to oral or visual presentation depends, to

⁴ Beighley. Ibid.
a large extent upon the channel being used for recall. These comparisons with Beighley's findings must be interpreted with caution since his method of testing was through multiple choice answers, which introduces a further question. How well did his testing cover the full area of comprehension and can it be accepted as recall in the same sense as the method used in this study? The first part cannot be answered because the questions used by Beighley are not listed. He does state however, that there were thirty questions and that each answer was from a choice of four. Two points make this system different:

1. Subjects are aided in recall by the question and suggested answers.

2. Individuality apparent in the replies in this study could not appear in Beighley's.

In addition, replies to material used in these tests were really the total quantity that could be recalled without any possible prompting from questions. Thus the total area of recall was tapped whereas Beighley's questions channelised answers and could have left many areas untouched.

Considering all the above points, this test does not confirm Beighley's answer to the first question and suggests that mode of recall could decide which is superior but that there is little real difference.
His fourth question was answered by saying that he failed to discover notable values in organised as against disorganised materials. He quoted Vernon as placing interest above organisation and both points concern these tests. Materials for Sets 2, 3 and 4 were progressively more difficult in complexity and the falling percentages of ideas recalled would seem to be a direct result even though Set 4 passages contained only 15 ideas as against twenty in the earlier tests.

PERCENTAGES OF IDEAS AND KEY WORDS RECALLELED FOR SETS TWO, THREE AND FOUR MATERIALS.

<table>
<thead>
<tr>
<th></th>
<th>IDEAS</th>
<th>KEY WORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set 2.</td>
<td>68</td>
<td>24</td>
</tr>
<tr>
<td>3.</td>
<td>57</td>
<td>29</td>
</tr>
<tr>
<td>4.</td>
<td>52</td>
<td>15</td>
</tr>
</tbody>
</table>

Key words show the effect even more obviously for Set 4 although there was an increase for Set 3. It is difficult to accept then, that organisation has

no appreciable effect upon comprehension when increased complexity of ideas produced the above figures. Beighley's questions would not appear to be testing the total capacity of the subjects as the present tests do. Vernon's finding is also difficult to compare since, in the materials used for these tests, judged importance of the central theme appeared to have greater significance in recall than interest, which of itself failed to show any direct influence.

This latter point may, however, be explained by the similarity of test materials in interest and construction.

Comparison of the tests in this study with other similar investigations suggests certain general conclusions and the need for further careful examination of the problem.

**SUMMARY.**

1. There are many differences between oral and visual presentation of material in terms of accuracy, construction, and total amount transmitted.

2. Nature of the material is one of the variables requiring further study.

3. Testing methods can influence results through the type and area of recall they tap.

4. The inadequacy of present descriptions of language
and the need for standardised terms in dealing with questions on language are apparent.

5. The contradictory findings show the subjective nature of language descriptions and the difficulty in setting up suitable tests.
CHAPTER XIV.

SUMMARY AND CONCLUSIONS.

THE PROBLEM RESTATEP.

Before considering conclusions and implications, a restatement of the problem is in order. At the outset, the problem concerned the effect of organisation, presentation and nature of material upon accuracy of transmission and the relative merits of oral and written channels in communicating the material. Implications for classroom teaching were also to be considered.

PROCEDURES USED.

Method of approach was through prepared passages containing arbitrarily defined ideas and relating key words which were presented orally and visually and also recalled through both these channels. Oral replies were typed from a tape recording and compared with written replies from both numerical and other aspects.

Passages in all tests were presented and recalled under identical conditions. Replies were examined in terms of specific numerical results as well as in terms of general tendencies that could aid in improving effectiveness of passages for later tests.

Subjects were divided into equated groups according to ability based on Otis intelligence tests.
For the final set of tests the subjects were also given the A.C.E.R. Reading for Meaning tests.

A preliminary pilot test showed up weaknesses in material used and test method and as a result later tests were progressively improved in efficiency as inadequacies became apparent.

Analysis and classification of replies posed a number of problems which could only be solved by using subjective judgments while attempting to maintain constant criteria. Ideas were only accepted as being recalled when definite evidence was present in replies and a coding system was used for recording ideas and key words.

PRINCIPAL FINDINGS.

Considering results from all tests the following conclusions can be stated with some degree of confidence.

1. Oral presentation and written recall proved to be most efficient, and more ideas were recalled through this channel than through any other channels used.

2. Method of recall has much more effect upon accuracy of recall than does method of presentation.

Written recall always proved superior to oral recall regardless of whether material was presented visually or orally.

3. Grasp and recall of relationships, as shown by recall of key words, was greater for written presentation
and written recall, except for Set 3 results which were not very dissimilar. Written language in both presentation and recall appears to have contributed to this since similar tendencies appear through other channels where written language was used.

4. Percentage of ideas and key words recalled is directly related to complexity of sentence structures and interdependence of ideas.

This trend continued to the fourth set where fewer ideas were used in the passages.

5. Oral recall produced most errors in every set of tests with oral presentation giving more than written presentation. This suggests a low level of efficiency for oral language and is reinforced by the fact that only 51 percent of possible ideas were recalled through oral presentation and recall in all tests.

6. The presence of some form of plan and organised attack in all written replies contrasted with the disconnected and hesitant approach which marked oral replied.

While agreeing with Quirk\(^1\) and Cherry\(^2\), this suggests that written recall expands the scope and complexity of expression possible while improving accuracy at the same time.

\(^1\) Quirk. Op. Cit.
7. All subjects completely recast the material and presented it in recall in a unique and personal style. Various influences affecting the final product appeared to be:

a. Judged importance of the ideas and their relation to what was considered to be the central theme.

b. Inherent ability to use language relationships and past experiences.

c. Position of ideas in the passages.

d. Personality and habits of the subjects.

e. Personal patterns of emphasis and habits of speech.

8. In every case, simplification of the sentence relationships, as well as the theme, took place. This would appear to be a general feature of verbal recall and agrees with Hildreth's conclusion.

9. Although oral presentation and written recall consistently gave more ideas in replies, a higher level of accuracy, as measured by ideas, key words, relationships, correct consecutive ideas and numbers of errors and omissions, were transmitted through written presentation and recall.

In addition, plan and organisation noted in reading replies tended to give an impression of greater accuracy.

10. All oral replies gave evidence of loosely structured

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and fluid thought processes as against the more closely structured thought processes evident in written recall. Modification of ideas and their organisation as recall progressed was obvious through changes in the flow and direction of thought. Carroll\(^4\) drew attention to this process and it can also be seen as an extension of Whorf's\(^5\) hypothesis.

II. The most common types of error were found in results from all tests. This suggests that similar tendencies to inaccuracy operated with all subjects and materials used. Errors appeared to be due to three basic causes:

a. Inadequacies in language abilities on the part of the subject.

b. Evaluations by subjects of importance of ideas as they were affected by interests, feelings and other factors within the subject.

c. Characteristics of language and organisation contained in the material being communicated.

Some of the errors easily fall into Spearman's\(^6\) grouping but his approach was more in the nature of an examination of underlying causes rather than a classification.


OTHER SIGNIFICANT TENDENCIES SHOWN.

Besides the above findings, certain tendencies appeared in smaller numbers of replies. Many of these contain subjective deductions based on the limited evidence and would require further testing to establish them more firmly.

1. Subjects tended to round off their stories, often inaccurately.

This recalls the findings of Bartlett\(^7\). Few isolated facts appeared and all subjects seemed to be striving to establish a well-connected total theme.

2. There was a strong tendency to use personal, colloquial expressions in oral recall. Shortened forms of words also appeared as Quirk\(^3\) noted.

3. In Set 2 there was evidence of a strong influence from recent or remembered experiences as shown in treatment of recalled material.

4. Complexity of sentence structures attempted was reasonably consistent with levels of ability as measured by the I.Q. and A.C.E.R. tests. Many variations were noted however.


\(^3\) Quirk. Op. Cit.
5. Oral recall gave a wider variation in scores than written recall which varied by only 4 ideas in group totals for Set 4 tests.

A similar tendency was also in evidence in a comparison of recalls from oral and written presentation.

6. There was a strong tendency for ideas to expand in the minds of the subjects. Phrases that summarized and ideas that were further developed gave evidence of this while oral replies from written material showed evidence of attempts to replace the continuous flow of ideas that had been encoded in the passages.

7. A number of replies, most of them oral, showed evidence of feedback, for example in alterations to sentences as words appeared to recall previous items.

8. As correct ideas and key words diminished in numbers from one reply to another, so did erroneous ideas and key words increase.

The final story always resembled the original in length and plan. It would appear that a general mental image of the material was grasped and the recall made to fit this regardless of accuracy.

9. Use of 'and' seemed to fulfill a number of purposes and was used frequently.
This supports Hildreth's idea on the difficulty reduction tendency. It was used as

a. a simple link between ideas when the original relationship was lost,
b. a 'thinking space' when a plan for expression of following ideas could be worked out,
c. a device for 'keeping the line open' and holding people's attention in oral expression,
d. a habit reaction and direct result from frequent use for other purposes.

TENDENCIES SHOWN IN A FEW CASES.

In some instances, subjects showed in their replies tendencies that could be influencing results to a greater extent than appeared on the surface. Insufficient cases occurred to establish these firmly and further investigation would require different types of tests.

1. One subject showed much greater ability in translating oral into written language and vice versa than in using the same channel for recall as had been used for presentation.

A few other subjects showed specific strengths and weaknesses in translation of oral to written language. These suggest that special skills are involved in these processes.

2. Part of the meaning seemed to be dependant upon sequence and plan of replies, although examination of replies did not disclose any reason for this. This became obvious when one subject gave a very complete account of the whole theme of one passage while recalling only eight of the original fifteen ideas. With another passage, while recalling thirteen of the fifteen ideas, a very incomplete story was transmitted. Similar comparisons appeared in replies from other subjects and could be due to the selection of ideas as the main theme. It is also likely that one erroneous idea could change the whole theme. Beighley\(^{10}\) did not find any differences in results because of differences in organisation of material although differences in method of recall could account for their non appearance.

\[\text{\textsuperscript{10}}\text{Beighley. Op. Cit.}\]
3. In some cases, particularly in Set 2 replies, there was a suggestion of personal involvement in oral replies that did not appear in written replies. It was hoped that this could be followed up in later tests but no evidence of the tendency appeared.

4. Extension of personality traits into replies appeared as noted in Chapter XII. It was less in evidence in written replies which were more formal in style.

5. In analysing replies, hesitancy and apparent lack of confidence noted in oral replies tended to have an effect upon the interpretation given by the investigator probably because of the loss of continuity. When the subject paused, the investigator was given more time to consider the likely ideas which might follow, consequently this 'set' would result in a greater number of errors of interpretation. This aspect of style would appear to have a direct effect upon accuracy and assessment of transmitted material and also raises the question of the use of meta-language. It is connected too with that meaning content not measurable in ideas and key words.
6. There was a tendency for continuity, broken by application of sentence structures, to be replaced by the interpreter. This appeared in oral replies from written presentation. It was also in evidence in joining word to word meanings into sentences and could account for much of the error that occurs.

**IMPLICATIONS FOR THE CLASSROOM.**

In considering the implications for the classroom of the results and conclusions from this investigation, three aspects of teaching are of particular significance. The first is the preparation and presentation of teaching material. The study indicates that the following points should be kept in mind.

1. Oral language teaching without written recall has very limited value in transmitting information and is not equal to written presentation and recall.

2. Simple relationships between points, and logical organisation of material being presented to pupils, aids in recall.

3. Greater use of written rather than oral language helps to preserve relationships between ideas more accurately.

4. Redundancy and unity of theme of information aids in transmission.
5. Allowance must be made for the unique and individual character of the interpretation given to material by pupils.

6. There is need for the further understanding of the psychological causes of errors and the arranging of teaching materials and situations to reduce these to a minimum.

The second aspect of teaching which is significant is the method used in recall of material by the pupils. The study draws attention to the greater accuracy that could be expected from written recall and the need for more careful appraisal of the methods of recall commonly used in schools, so that adequate sampling may take place.

The third aspect concerns the more frequent communication situations that occur from day to day in both formal and informal settings.

1. More careful analysis of content and accuracy in oral language contained in pupil's replies is called for so that incorrect ideas can be separated from correct ones and an accurate evaluation of replies made.

2. There is great need for broad experience with language structures so that pupil's language interpretations and capabilities are extended as far as possible.
3. The teacher should be aware of the extensive losses in accuracy and content in language communications so that he can find and correct the resultant errors.

The importance of these points in the classroom can be appreciated when it is realised that efficiency of the teaching situation depends to a great extent upon accuracy in language transmission and that many inaccuracies and misinterpretations can occur through language inadequacies.

PROBLEMS REQUIRING FURTHER RESEARCH.

In the field of language communication, there are many areas that contain unanswered problems. Some are basic in that solutions are necessary before further studies are practicable and profitable. Chief among the basic ones are:

1. The problem area of language meaning and objective description. Up to the present, although Ogden and Richards \(^{11}\) attacked the question at length, investigators must still set up their own

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criteria of objectivity, and this severely limits value of results.

2. The area of relationships, complexity and difficulty of language material. Individuality of the perceived nature of material hinders progress in this field.

There are many secondary problems also that invite further study if workable answers can be obtained to the above problems. Some of these are:

1. The causes of errors. Although much useful work has been done in this area, much still remains to be investigated.

2. Evaluation of importance of details by the subject as it affects recall.

3. The nature of changes in material and ideas as they pass through the minds of subjects.

4. The effect of personality traits upon language.

5. The effect of sentence structures upon thought processes and expression.

6. The types of abilities involved in converting received information into expressed recall.

7. The effects of gestalt factors of nearness, continuity, similarity and closure in transmission of
language material.

8. The nature of the subject's language consciousness as he receives information and reacts in selecting relevant meanings.

These and many closely related questions, although they have received attention from some investigators, still contain many unresolved problems.
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APPENDIX.
APPENDIX A. MATERIALS USED IN TESTS.

SET 1. No. 1.

Long ago, in a country called Styria, there was a lonely valley. Though it was walled in all round with steep and rocky mountains, this valley was most pleasant and fruitful. There were high peaks nearby which were always covered with snow, and from these a number of torrents found their way downward by leaps and bounds.

SET 1. No. 2.

"Hello!" said the little gentleman; "that's not the way to answer the door. I'm wet; let me in". "I beg pardon", said the boy; "I'm very sorry, but I really can't". "Can't what?" said the old gentleman. "I can't let you in, indeed my brothers would beat me if I thought of such a thing".

SET 1. No. 3.

Sydney's a big place. It's got a big harbour with lots of bays all round it where people can sail boats or swim. There's a big bridge over the harbour and cars, buses and trains cross over it all day long. It's the biggest city in New South Wales and Australia.

SET 1. No. 4.

"Where are you going Tom?" Mary said. "I'm going to Bill's birthday party and I've got a book for him. I hope there'll be plenty of ice
cream there 'cause I like it". "You greedy thing!"
replied Mary. "Bring some home for me".
SET 2.

Because it was a cold day, John put his coat on when he was going out but later took it off after the sun began to shine while he was walking down the street. He carried it on his arm until, after having boarded a bus and found a seat in it, he placed his coat in the luggage rack. After leaving the bus he watched it move off then remembered his coat which was still in the luggage rack. Next day he called at the lost property office to find out if someone had handed it in. The coat was there but, since he did not have in his pocket the sixpence which had to be paid, he had to go home without his coat.
John is not allowed to swim at Brighton because he has a cold. He caught it a week ago when he did not change his wet clothes after being caught in the rain. The cold has not improved although he has been kept inside all the week and has been sent to bed early every evening. If his cold improves before the end of the week, he will be allowed to have a swim if the weather does not become cold. He is very disappointed because he has a new bathing suit which his aunty gave to him a month ago. He wants to go swimming every day at Christmas because he has just learned to float and hopes to be able to swim properly when he returns to school next year because there will be a prize given to the best learner.

John wanted to grow some good cabbages although he found the ground very hard to dig until his father came to help him because he was taking so long. He hoed the ground up before he planted his seeds and looked after them carefully while they grew bigger but found it hard to keep the white butterflies off them, therefore he began looking for caterpillers under the leaves. He hopes to sell some to the corner shop if they are ready in time since the shopkeeper has agreed to take them unless they are soo small which would be very disappointing to John.


Jane had planned to go to see the procession although the weather was very cold the day before but the weather report promised an improvement until the afternoon began unless the wind changed very suddenly. Her mother told her she could only go if the weather was fine because her cold was not quite better and her best shoes were worn thin. Jane was very excited about it since she had never seen a procession before therefore she kept asking her mother about it while she was dressing next morning before she caught the bus which was to take her to town.
Alan wanted to ride his bicycle to school but his mother thought he should walk because he had been very sick and needed to look after himself if he was not to become sick again. His mother told him not to go swimming since he might catch a cold which would prevent him from entering the school swimming sports, therefore he read a library book while the other boys were swimming. He was very disappointed although he knew he would be allowed to swim before the term holidays began unless wet weather stopped him from swimming until it was too late to enter the races.

Mary wants to go shopping with her mother because she hopes to be able to buy some new shoes which she saw in a shop window while coming home from school one afternoon. She is not allowed to buy them unless she earns the money at home before the holidays begin since her parents are taking her to the country if her father can find a suitable place for camping. Mary hasn't saved up enough money yet although she has put away all her pocket money and has done extra jobs too, but her sister will lend her some money until she has saved some more, therefore she will be able to buy the shoes.
APPENDIX B.

Replies From Three Subjects.
No. 1. John.


John was wanted to plant some seeds in his garden but he found the soil hard to dig and he couldn't get it done till his father came along to help him because he was taking too long and when he had planted them he hopes that they will grow up but he has trouble with the white butterflies and looks for the caterpillars which are under the leaves. He hopes that he can sell some of his plants to the grocer along the road who has agreed to take them if he is in time.

Channel B. Oral Presentation and Written Recall. Material b.

Jane was going to go to the procession although the weather had been cold yesterday. But the weather forecast promised an improvement, until the afternoon unless the wind suddenly changed. Mother said she could go if the weather was fine because her cold was not quite better and her new shoes were worn thin. She was very excited because she had never seen a procession before. She kept talking about it as she got dressed that morning.
Channel C. Written Presentation and Oral Recall. Material c.

Alan wanted to ride his bike to school but his mother would not allow him because he had been very sick and had to look after himself if he did not want to get sick again. He was not allowed to go swimming and catch a cold because he would not be allowed in the swimming races and he had to read a library book while the other boys and girls were having their swim. John was very disappointed but he knew he would be allowed to swim before the end of the term unless there was wet weather.

Channel D. Written Presentation and Written Recall Material d.

Mary wants to go shopping to buy some new shoes she saw there one afternoon. She has to earn the money to buy the shoes before the holidays because they are going away if dad can find a suitable place. Her sister might lend her money if she hasn't earned her money in time and she will be able to buy the shoes.

Note: In these replies, errors and changes have been left as in the original.

It's about John and his cabbages. He is planting them one afternoon or something and is getting a bit of trouble with the ground and he can't dig it very well and his father comes along and he helps him dig it and um they get through quite well and he John is also having a bit of trouble with these white butterflies and he is trying to catch them out on the cabbages because they're a nuisance and for the caterpillers and he is going to sell the cabbages when they grow nice and fine and big to the shopkeeper along the road and the shopkeeper has agreed to take a good few of them unless they are too small. The shopkeeper if possible wants nice, great, big, fat round ones.

Channel B. Oral Presentation and Written Recall. Material b.

This story is about Jane. Well Jane wanted to go and the procession. Her Mother said she could go providing the weather report was alright. Her Mother said if the weather report promised rain Jane could most definitely not go. Why her Mother said this is because she told Jane her cold was not properly better, and that her best shoes were getting a bit thin in the soles. The next morning Jane kept pestering her Mother and asking if she may go.
It's about Alan and he had had a bad cold and he went back to school and he couldn't go swimming and he was very upset and his mum said that he'd get a worse cold if he went in swimming then he'd be very ill and Alan was awfully upset and he when all the other boys were going swimming he had to sit in the classroom or sit somewhere and read a book and he was very lonely. He felt very lonely because he loved swimming.

This story is about a little girl, she was going shopping with her mother. She hoped very much to be able to have a new pair of shoes. She knew exactly what she wanted because she had seen a pretty pair in a shop window on her way home from school. Her Mother wouldn't buy the shoes straight out but said that her daughter had better save up enough money to buy them herself. Although she earned a lot of money and put it away in her money box she hadn't enough. Her father took her out into the country. There she couldn't get much then. But her sister offered to lend her some.
It's about Jane. She decided to go to this procession and it wasn't a very nice day and it changed and um Jane she wanted to go and the weather changed 'cause it was dull and it was um it was bright and she had never seen the procession before and her mother decided to let her go and she got on the bus.

Peter's mother did not want him to ride to school and he was sick in bed and he was all right for a while and he wanted to go swimming and he was not allowed. So he took along a book and read it as well as watching the boys swimming because it was too wet for him to go swimming and he wanted to go because he liked swimming very much but he did not go after all.

It's about Mary wanted to go shopping and she didn't save enough money to buy some shoes 'cause her mother said and she wasn't allowed to get them. She hadn't had enough money and so they decided to go out to the country and Mary was allowed and her mother was going to take her shopping and-
John wanted to grow some cabbages and he found that the ground was too hard. He wanted to see if there are any in the shop because he wanted to buy some. He waited till the man's next door to grow so he wanted to buy some off him. He was going along to the shop to see if he had any there and there were some but they weren't very good. He thought he would wait till he would plant his own when it is warm. It became warm and his own came up.