THE ROLE OF CONTEXT IN LITERAL, METAPHORICAL, AND PICTORIAL INFORMATION PROCESSING

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Thesis submitted for the degree of Ph.D.

University of Leicester

May,1982

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ABSTRACT

One aspect of communication is investigated in this thesis by studying what role context plays in both verbal, either literal or metaphoric sense, and pictorial material.

The research is inspired by Bransford and Johnson's (1972) study on cognitive prerequisites for comprehension. It deals with the manipulation of context by pictorial information and/or metaphoric cues.

The thesis examines three main questions. First, if context plays an important role in both literal and metaphoric prose. Secondly, if the appropriate context is a function of the material being used. And finally, whether schemata provided by the context are formed only at encoding or, also, at retrieval for metaphoric prose.

The data suggested a positive answer to the three main questions. They also showed that, for processing a metaphoric prose, a significant interaction was found between testtime and cue presentation when subjects were presented the text and the pictures at the same time, (context was manipulated in two ways: presentation of material and cue). When the metaphoric cue was given at encoding, recall performance deteriorated if subjects were tested immediately but it improved over time. On the contrary, when the cue was given at retrieval, the reverse effect was found. It is emphasized how stronger elaborations are needed to process this kind of material as oppose to the processing of literal texts.

The role of context in prose processing, either in its literal or metaphoric sense, as well as in pictures is discussed in relation to schema theory and its formation either at encoding or retrieval.

ACKNOWLEDGEMENTS

A large number of people helped to produce this thesis during its different "contexts".

First of all, I would like to thank enormously to the staff of Leicester Psychology Department, especially to Dr. A.Mayes, Prof. W.Sluckin, Prof. J.Reason, Mr. D.MacArthur, Mr. J.R.Ashworth, Mr. G. Evans, Miss. R.Benford and Mrs. M.Frappe who were most helpful,sympathetic and friendly during the period I was there. I will "never forget" them.

Mrs. Anne Taylor-Davis was a very sympathetic and stimulating supervisor and helped me enormously in the final version of this thesis.

Also I would like to thank my students at Madrid University who participated voluntarily in all the experiments without thinking to have a "better mark".

It is not possible to mention all those who had contributed, in so many ways, to this thesis but at least a few deserve to be named.

Dr. Nancy Waugh, Dr. Graham Hitch, Dr. Bob Boakes, Dr. Denis Hilton and John Churcher have all provided me with stimulating ideas and criticisms throughout this thesis.

In the Spanish "context" competent psychologists from "today and tomorrow" as Pilar Soto,Eugenia Sebastián,Victor García-Hoz Rosales,Ileana Enesco,Elvira García Bajos,Tomás del Amo and Sindi Alonso have also provided me with long and patient discussions and friendship during this long period.

Dr. Marriot and Peter McLeod in Oxford, and Luis Lázaro and J.Matías in Madrid, helped me with the statistical analyses.

I am deeply grateful to both our families, Sebastián and Linaza,for their psychological and financial support.

My sons,Juan and Jaime Linaza Sebastián,suffered the consequences of doing and writting-up their parents' theses and,I hope that they will understand the "stressful context" and will be compensated and have on the whole a "good memory" of their parents. Josetxu Linaza has been always worried about the context in which everything was said or written.This thesis was inspired in his own worry and he has followed it throughout those years with despair, patience and support. This thesis is devoted to my three Js' , Josetxu,Juan and Jaime.

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INTRODUCTION.

Communication plays an important role in survival both for animals and man.

In everyday life, people are constantly faced with series of communicational tasks ranging from reading news-papers, novels, specialised books etc., to giving lectures, talking about politics, the weather, etc. In using language as a human medium of communication, either as the source of messages for others, or as the receiver for messages from others, people have a means of communication in their hands which can take place in different ways. People speak or listen, read or write. In order to do these actions, meaning has to be provided in all of these activities and, more important, people have to comprehend this meaning in relation to the context in which a word, a sentence, or a text appears.

In order to grasp the meaningfulness of what is read or said, it has to be stored in a memory system.

Although the processes of comprehension and retention of meaningful written material, and its context have been taken for granted, they have been relatively neglected until recently.

The exception to this was Bartlett's now classic book, "Remembering", published in 1932. Bartlett was interested in studying how people understand and retain literal prose material or pictures. He found that subjects "distorted" the material, in the sense that they reproduced it according to their own knowledge and context. In other words, they reconstructed it. Bartlett's explanation to the subjects' distortion was made in terms of schema. (A concept also used

by other eminent psychologists, (Piaget,1970; Neisser,1976)).

Generally the term schema refers to a unit of organized knowledge about events, situations or objects. In this way everybody would have schemata on for example, how to play tennis, on what a penny look like, etc. Schema or schemata are mental structures by which internalized knowledge of the world can be represented.

Schemata have been assumed to play an important role in perception (Neisser,1976) as well as in prose processing. The functions of schemata have been found to take place in the process of how words are perceived in reading, (Rumelhart,1977), of the perception of pictures, (Bruner and Potter,1964), and in both data-driven or conceptually-driven processing. (Norman and Bobrow,1975), as it will be discussed in chapter V.

Although Bartlett's view of memory was important from the theoretical and methodological point of view, he has been strongly criticized by behaviouristic psychologists because his concept of schema was considered too vague, and his method did not allow him to "control" the learning situation. Therefore his theory was virtually forgotten for more than thirty years.

Ever since that time, memory research has been more concerned with forgetting, rather than with the remembering processes. For decades, behaviourism monopolized the studies on verbal-learning, and the theoretical explanation was in terms of the association between a stimulus and a reponse.

In the decade of the sixties, the most important distinction was made between short- and long-term memory. Even with the growth of cognitive psychology, whose purpose was to study higher mental processes, the emphasis on memory research

remained on studies about the characteristics of temporary retention. Its fundamental concern was to find out how items temporarily held were encoded, forgotten and structured, (Broadbent, 1958; Waugh and Norman,1965; Atkinson and Shiffrin, 1968). On the other hand, these models raised the question of whether the different characteristics of temporal and permanent retention were due to different memory systems or a unitary memory system, (Melton,1963; Craik and Lockhart,1972).

Most of the material used in these experiments were lists of words, digits or nonsense syllables with an emphasis on the control of variables which were quite susceptible to the laboratory manipulations, and remote from everyday life situations.

Since the seventies, the emphasis of memory research shifts both theoretically and methodologically, changing towards the structures and processes in the permanent retention of the information. Now experiments are more concerned with everyday life situations as prose processing. Thus, it seems that "Bartlett's approach" has been revived.

During the seventies,context came to be recognized to play an important role in cognitive processes such as in language, (i.e. Bates,1976), pattern recognition (i.e. Norman and Bobrow, 1975; Lindsay and Norman,1977), attention (i.e.Dixon, 1981) and memory, mainly comprehension and the retention of meaningful material (i.e. Bransford and Johnson,1972,1973).

Bransford and Franks (1971,1972) pointed out for example, in order to understand sentences, their meanings have to be combined to form more holistic, integrated ideas, through a constructive process. Bransford and Johnson (1972,1973) examined the issue of cognitive prerequisites for comprehension.

They demonstrated that the ability to understand and to remember a text is always a function of the relationships between the material to be learned, (i.e. the text), and the currently activated knowledge of the learner. Appropriate knowledge is very important for understanding not only linguistic material but also visual objects.

In general, most messages do not explicitly contain all the information necessary to be comprehended in an effective way, so that people have to make inferences and assumptions based, of course, on their general knowledge of the world.

Context has been manipulated with different situations such as pictorial settings, titles, perspective changes or reader's background. In all these situations, subjects' comprehension and their subsequent recall could be altered in some way or another.

From the methodological point of view, the research on memory during the seventies and early eighties has been increasingly concerned with real-life situations, providing an important ecological validity to the studies carried out during that period. Experiments were based on sentences, prose or pictures rather than lists of words. The plea for what Brunswick called "ecological validity" was made in the fifties, but it was not to be considered in cognitive psychology until recently, (see Neisser,1976; Baddeley,1981).

Baddeley (1981) has recently suggested:

> "Over the last forty years, experimental psychology has concentrated almost exclusively on studying behaviour in the laboratory. While laboratory-based research is likely to retain its importance, it is essential that the theories and concepts developed in this way be exposed to the more bracing conditions found from outside the laboratory".
>
> (Baddeley,1981, p.257).

From the theoretical point of view, representations of subjects' knowledge have come to the fore-front of psychological research and been revived either in terms of schemata, scripts, frames or representations.These terms have been used to account for how people process prose materials. Although the study of prose processing and the role of schemata have mainly been concerned with literal prose, it has been extended to figurative language such as metaphors in the last couple of years. The study of metaphors comes from the classic philosophers, but it has not made much progress since. One of the main problems in studying metaphors has been its definition.

The research on metaphoric prose would be important because it might illustrate the role of both context and schemata, but also it might be a way to show what kinds of elaborations subjects made in order to remember this kind of material.

The main aim of this thesis is to obtain a detailed description of what role context plays in prose processing. The three main empirical questions were as follows:

1) Does context play a role in literal and metaphoric prose ?
2) Is the appropriate context (i.e. text and pictures) a function of the material being used ?
3) Has the appropriate context to be present only at encoding, or is it also necessary at retrieval for a metaphoric prose to be processed ?

These three empirical questions are related to some

other theoretical assumptions. Some of them are relevant to Bransford's proposed approach on the comprehension and remembering of prose. They can be stated as follows :

a) Bransford assumes that when context is manipulated by pictorial setting, subjects who have the appropriate context before they read a passage, would comprehend better than those who do not have the context. However, it is possible that the optimal condition for both comprehension and retention for prose has not been studied by Bransford's experimental designs. More concretely, it is hypothesized that a Simultaneous Presentation of a passage with its corresponding pictorial informations would allow subjects to perform at their highest capacity.

b) If the processes involved in comprehending and remembering a text are the same when subjects take it either literally or metaphorically, it is assumed that the condition mentioned above, i.e. Simultaneous Presentation of pictures and text would provide subjects' best performance for both kinds of material.

c) Bransford assumed that schemata are only formed at encoding: By providing the subjects with a metaphoric cue, this thesis explores the possibility that schemata could also be formed at retrieval of the information. If that is the case, Bransford's model would have to be reformulated.

d) To understand a text in its metaphoric sense presupposes subjects' ability to comprehend it literally.

Therefore elaborations to process a metaphoric text in order to remember it are assumed to be greater and deeper than those required for the same text if taken only literally.

e) Finally, how some current schema theories for text processing could account for data on metaphoric prose reported in this thesis is discussed.

In relation to these studies some methodological issues should be emphasized:

a) The material chosen to be learned was taken from "real" situations rather than by using a "laboratory" material. For example, the text and pictures provided came from a daily newspaper (Chapters III,IV and V).

b) A particular difficulty in using metaphoric text could be the individual differences in both familiarity and motivation in relation to the specific material to be processed. By choosing a real-life event to which the newspaper refers metaphorically, and which had a "deep impact" on the Spanish population, it could be assumed that there would have to be an equal sensitivity and capacity in all the subjects (University students) to understand it.

c) Therefore, this thesis attempts to perform experiments that could be considered "ecologically valid", situations so often recommended in cognitive psychology and almost equally often forgotten.

CHAPTER I.

STUDIES ON THE ROLE OF CONTEXT IN MEMORY FOR PROSE.

One of the earliest approaches to memory has been the Ebbinghaus' approach (1885) which emphasized the possibility of using the experimental method for studying human memory. Ebbinghaus, being his own, and only, subject, controlled the learning situation and quantified his own responses.

Bartlett (1932) criticized Ebbinghaus because his method was very simple in the sense that it did not reflect everyday life situations, where memory was involved. Bartlett was more interested in the qualitative than in the quantitative aspect.

I) RECONSTRUCTIVE APPROACH.

Bartlett's approach can be considered as the second major traditional approach to the study of human memory, (see Baddeley, 1976, 1977). Although he was not the first one to propose that memory is composed of abstract, non verbatim, representations of the world (Wundt, in Blumenthal, 1970), he is the best-known early writer on this approach, and in that sense, he can be considered one of the pioneers of cognitive psychology, in the study of human memory.

Bartlett's book is concerned with a description of several experiments using meaningful material, (e.g. simple descriptive paragraphs or stories), as opposed to the lists of words employed by Ebbinghaus. He asked subjects to reproduce the material on several occasions (repeated reproduction) or used different subjects so that, the first subject would reproduce it in front of the second one, and this subject would then reproduce it in front of the third, and so on.

The most famous example derived from Bartlett's work involves the story of, "The War of the Ghosts", a story about two Indians going to war. The reproduction made by subjects of this story over time illustrated the kind of changes that subjects made in their recall protocols. Subjects shortened the passage over time and distorted it, adding things from their own knowledge. The characteristics of these changes can be summarised as follows :

a) Omissions - Subjects omitted details and also, and most important, extraneous information that did not fit in with the subjects' expectations.

b) Rationalization - Subjects introduced new material, mirroring the subjects' own experiences, in culture or vocabulary in order to explain incongrous features of the passage.

c) Dominant detail - Subjects made small details central to the passage.

d) Transformation of detail - Subjects changed words and names to make them more familiar to them.

e) Transformation of order - Subjects changed the order of events.

f) Importance of the subjects' attitude - When subjects tried to remember a passage, the first things that they recalled were the attitudes towards the material.

In attempting to explain these results, Bartlett maintained that people remembered only those aspects of the material that were important to the individual, or contain key information, depending upon the context, linguistic and physical, in which the stimulus was presented. These aspects were the only ones stored in memory. Bartlett assumed that memory representation could be, and was, supplemented by information that subjects inferred from

the material but also from general knowledge of the world.

According to Bartlett:

"Remembering is not the re-excitation of innumerable fixed, lifeless and fragmentary traces, it is an imaginative reconstruction, or construction, built out of the relation of our attitude towards a whole active mass of organised past reactions or experience, and to a little outstanding detail which commonly appears in image or language form. It is thus hardly ever really exact, even in the most rudimentary cases of role recapitulation". (Bartlett, 1932, p.213).

When subjects were tested, Bartlett assumed that they had access to memory representation, or schema, by using complex rules or strategies to "reconstruct" the original stimulus configuration. This schema, or these schemata, abstract cognitive structures, are the result of how subjects extract information from the environment and how they combine it with their own knowledge already acquired. So, old schemata are transformed when new information is added.

The rationalization characteristic in subjects' distortions, outlined above, illustrated clearly this point. They were able to retain some aspects of "The War of the Ghosts" story and recoded the information in terms of their own cultural biases and past experiences. The number of errors made by subjects would depend on how the schemata employed were, or were not, appropriate. When they incorporated the appropriate schema to the story to be learned, they would not make many distortions. On the other hand, when subjects' schemata were not appropriate, the result would be to make serious distortions out of the meaning of the material. That was the case, when Bartlett asked British subjects to remember a North American folk-tale. The schemata of British subjects were different because of cultural and personal factors from that of the North American Indians who made up the tale.

At about the same time as Bartlett published his book, Carmichael and associates (Carmichael, Hogan and Walter, 1932) showed this reconstructive memory with a different material from the one used by Bartlett. They presented line drawings to three groups of subjects. The first group was given the labels in relation to a set of objects , and the second group in relation to a different one. The third group, the control group, was given the pictures without any labels. The three groups were asked to recall all of the pictures and to draw them. They found that the groups, where labels were given, drew the pictures in a manner related to the presented word. These results showed that subjects' retrieval of the line drawings implied a reconstruction of them according to the labels presented.

Carmichael and associates' study supported the reconstructive processing suggested by Bartlett. At the time, this reconstructive approach to memory received little attention, partly because psychologists were deeply influenced by behaviorism.

It is true that the method of repeated reproduction is not very reliable, because it is difficult to assess whether subjects based their recall on the original learning or on their own first recall of the material.

Another reason for this lack of influence by Bartlett was that his theoretical position was not well defined, in particular what constituted a schema and the nature of complex rules and strategies that people were assumed to use. From this, it followed that the term "schema" was considered "mentalistic" for the mainstream psychology of that time.

It was a pity that Bartlett's approach was largely

forgotten for decades, because his view on human memory can be considered as an active process involving "effort after meaning", and his method was an interesting way to fill the gap between the laboratory and everyday life. An important aspect that studies on human memory have not taken into account until recently (see Neisser, 1976).

Bartlett's approach was more influential on other psychology fields than on human memory. For example in studies on problem solving, cognitive development, etc... (see Bruner, 1973).

However,among the few studies on human memory related to Bartlett it is worth mentioning those of Gomulicki (1956) and Johnson (1970). A common feature of both studies is the conceptualization of memory as an abstraction process.

Gomulicki (1956) asked subjects to read and recall passages of prose, scoring the number of ideas they could correctly recall. His results showed that subjects recalled what they considered the most important ideas of the passage. And most important, he found that subjects' ideas recalled were quite similar to those produced by other subjects who had been asked to summarize the passage.

Johnson (1970) used a different procedure, asking subjects to delete the less important ideas of a story to reduce its number of words to one quarter, half, or three quarters. He also manipulated the retention intervals in this experiment from a few minutes to two months. He found

that what subjects considered the more important ideas were better recalled than the less important ones for all delays.

Both studies show that this process of abstraction takes place at learning, rather than over time.

Since the mid-1970's, there has been a revival of interest in cognitive psychology, especially in the concept of schema related to memory for prose.

A number of later studies (Zangwill, 1972; Cofer, 1973) was unable to replicate Bartlett's findings, and his reconstructive memory came under attack. A student of Bartlett,Zangwill, said: " In my view it was never plausible,... is perhaps best forgotten" (Zangwill, 1972, p. 127). However, some work carried out by Spiro (1977) supports the notion of reconstructive memory.

One of the criticisms was that recall was accurate and subjects' performance did not show all the inferential errors that Bartlett reported. The argument was that if the term reconstruction is correct, subjects would fall into errors more frequently. Spiro (1977) argued against it because he suggested that frequency of errors is not a good index of reconstructive memory. He claimed that such errors would only occur under two conditions.

First of all, the number of reconstructive errors should

increase when subjects attempt to integrate the to-be-remembered

material into their overall knowlege. When they do this, they would make inferences from existing cognitive structures. Secondly, if the schema by which material is comprehended is modified by later information, then it might be that the schema guiding retrieval is different from the one used to encode the material.

Spiro manipulated these two conditions. He asked subjects to read one of two different stories dealing with an engaged couple, Bob and Margie. In one of the stories Bob did not want to have children and communicated his desire to Margie. At the same time Margie had the same beliefs, and so both were relieved. The second story is similar to the first one with the exception that Margie is completely disappointed by Bob's desire and they discuss it. Some subjects read these stories with the expectation that the story was concerned with memory. Other subjects were told that the experiment was about interpersonal relations and that the stories were true. After the subjects had read the stories, they were told either that Bob and Margie got married and were very happy, or that they never got married and split up, or nothing was told about them. Subjects were tested after either 2 days, 3 weeks, or 6 weeks. Spiro's predictions were that subjects would make more errors when they were told that the experiment was about interpersonal relationships, and when their expectations were changed by subsequent information, or when the delay was longer. Spiro's findings supported his predictions.

Reconstructive memory seems to play an important role in how subjects process prose materials both at comprehension and recall.

Inferential processes such as those reported by Bartlett

and Spiro play important roles in everyday life. Recent data (Loftus, Miller and Burns, 1978) showed the importance of leading questions (e.g. in automobile accidents) used by lawyers and judges, providing convincing evidence that recall of visual scenes could be biased by misleading information.Loftus et al. (1978) presented to the subjects slides where a red car stopped at an intersection with either a stop or a give way sign.After viewing the slides, subjects were asked different questions like " Did another car pass the red one while it was stopped at the stop (or at the give way) sign ?". For some of the subjects this particular question was consistent with the slide they have seen previously (give way sign), while for other subjects it was misleading (stop sign).Subjects were given a forced-choice recognition task afterwards in which several pairs of slides were presented, including the one with the red car at either the stop or the give way signs, from which they have to choose which one they had seen before.It was predicted that subjects given consistent information would pick up the correct slide, while those given misleading information would be biased by it. The results supported the prediction.

This research on leading questions is important from the legal point of view and shows that there are rules to indicate when such questions could be used.

II) CONSTRUCTIVE APPROACH.

Although the idea of the context in comprehension and remembering prose was implicit in Bartlett's approach, he did not study it explicitly.

By context, it is meant in general, the overall setting in which an item to be perceived, attended to, comprehended or remembered is embedded.

In the decade of the seventies, the importance of context in human information processing is taken into account not only from the linguistic point of view, but also in processes such as pattern recognition, attention and memory (see Norman and Bobrow, 1975).

From the linguistic point of view for example, in order to understand sentences, different strategies are employed. These strategies use such cues as word order, relative pronouns, and inflections to understand the sentence meaning. From the memory point of view, these sentence meanings are not stored independently but are integrated into a wholistic semantic form, through a constructive process (Bransford and Franks, 1971).

Recent evidence (see e.g. Bransford, 1979) suggests that in order to understand fully the comprehension of sentences and textual materials, it is important to examine the role of context. Language is understood as a function of its context. What people understand is not only influenced by the information conveyed by the written or oral language, but also by the expectations that people have about it. This would be the case whether one is concerned with the understanding of a word in a sentence, a sentence in a paragraph, or passages as a whole.

Strange, Jenkins and Wilson (in Jenkins, 1979) presented

two stories to the subjects. After they had read just one of the stories, subjects were tested for word recognition. It consisted of three types of words. First, words that had been presented already in the passage previously read. Secondly, words synonyms of these and other words from the story. And thirdly, words synonyms of those present in the second story, unknown to the subjects. It was found that subjects' recognition was high for the first type of words. With the second type, subjects failed to recognise half of the words, while only one quarter of the third type of words were (falsely) recognised.So, it seems that subjects interpret identical words quite differently according to the story version they have read. Differences in subjects' memory were not due to the words themselves, which have remained the same for all subjects in both conditions, but to the structure in which these words appeared, i.e. the story context presented to each subject.

The same trend of results was found by Anderson and Ortony (1975) who manipulated the word "bottle" in two different sentences, i.e. the container held the cola versus the container held the apples. The word "bottle" would be a good memory prompt for the former, but not for the latter.

Other studies have pointed out the important role played by this semantic context in memory for sentences. For example Barclay, Bransford, Franks, McCarrel, and Nitsh (1974) showed that a word presented in isolation would have a small number of dictionary meanings, while its range of meanings would increase substantially if the same word was presented in the context of a sentence, (e.g. the isolated word

word "piano" versus the sentences "the man lifted the piano" or "the man tuned the piano", where the meanings of weight or sound were alternatively emphasized).

From these studies, it can be concluded that the meaning of words within sentences depends on the context in which these words appear.

Much in the same way, the context in which a passage is read influences people's ability to understand the meaning of the passage. There have been different manipulations of contextual situations which influence the interpretation and retention of the passage. One purpose of this thesis is to analyse the different situations in order to suggest an explanation of how context influences prose comprehension and retention.

These contextual situations can be divided as follows:

a) Pictorial settings.

Pictorial information can influence people's ability to comprehend and retain prose passages. In a now classic study, the "Balloon/study" by Bransford and Johnson (1972) subjects were asked to read a passage. They manipulated the presentation of the pictorial setting, one group saw the picture before they read the text (Context Before), and another group saw the picture after (Context After). Some groups did not see it at all, (Without Context), or saw it before and only partially (Partial Context Before). The Without context group were divided into two subgroups. One heard the passage twice, and the other only once. All groups were asked to rate the text for comprehens-ibility on a seven-point scale, and recall it as accurately as possible.

They found that the Without Context (one repetition) group rated the passage as very uncomprehensible and its recall performance was very low. However, the Context Before group said that the text was quite comprehensible and therefore they could remember quite well. Their recall was almost twice that of the Without Context group (one repetition). The Context After group rated the passage as uncomprehensible and its recall was not better than Without Context (one repetition). For the Partial-Context Before group, although the picture which they saw had all the objects of the other picture, the relat-ions among them were different, and so, the overall context was not the same. This group was inferior to Context Before in both comprehension and recall. The Without Context (two repetitions) group also had low comprehension and recall.

Bransford and Johnson clearly found that in order to

understand and remember prose, it is necessary to establish a relationship between inputs and the activated knowledge of the learner. In this experiment, the picture (the appropiate context) provided the basis to interpret the text meaningfully and to organise the sentences they heard.

In a subsequent study, Nyberg and Cleary (in Bransford and Johnson, 1973) instead of using a free recall task, gave subjects key words from the Balloon study as retrieval cues.

They found that with retrieval cues, the Without context group could understand even less than without them. However, the Before context group had a better performance both with the cues and without them.

These two studies showed that context, manipulated by pictorial setting, is crucial to understand and to remember a passage which is difficult to "structure" without it. It remains unclear whether the pictures would also aid both processes in the case of a passage which is reasonably comprehensible by itself.

b) Titles.

The presence or absence of titles, given before or after the subjects read a passage, has been manipulated very often in the memory for prose literature, to assess the importance of context.

These experiemnts (i.e. Bransford and Johnson, 1972, 1973; Dooling and Lachman, 1971) presented subjects a passage and asked them to rate it for comprehensibility and to recall it as accurately as possible. One group was not provided with any title at all (No Title condition).

A second group was given a title before they heard the text (Title Before condition). A third group had the title after they had heard the text (Title After condition). Different results have come out of this.

Title Before conditions had a facilitating effect on both free recall and comprehension (Bransford and Johnson, 1972, 1973; Dooling and Lachman, 1971; Dooling and Mullet, 1973; Barclay et al., 1974; Kozminsky, 1977; Britton et al., 1981; Schwart and Flammer, 1981; Alba et al., 1981).

However, Title After conditions did not facilitate either comprehension or recall (Dooling and Lachman, 1971; Dooling and Mullet, 1973; Bransford and Johnson, 1972, 1973).

The No Title conditions rated the passage as incomprehensible and had low levels of recall (Dooling and Lachman, 1971; Bransford and Johnson, 1972, 1973) or recognition (Schustack and Anderson, 1979).

These findings showed that a title can provide the context of the passage, affecting the ease or difficulty of comprehension and retention at the same time.

As Bransford (1979) suggested:

> "These findings indicate that simply having prior knowledge when making comprehension rating or recalling is not necessarily sufficient to ensure adequate results. Previous knowledge must be activated in order to facilitate one's current abilities to understand and learn". (p. 135)

It seems important to bear in mind Bransford's counter-position of possession of knowledge versus activation of it. In this way, it would be possible either to facilitate or suppress the comprehension and recall of information being processed by the subjects. Further studies would be necessary to assess the effects cues might play in the

activation of knowledge.

c) Perspective shift.

In another set of experiments (Pichert and Anderson, 1977; Anderson, 1978; Anderson and Pichert, 1978; Flammer and Tauber, 1981; Fass and Schumacher, 1981) a story about two boys playing truant from school was presented to three groups of subjects. One group read a story from the perspective of a burglar, another from a potential home buyer, and the last one with no perspective at all. Subjects were asked to rate which idea units were essential to the meaning of the passage. Mean rank order correlations were very low, suggesting that subjects with different perspectives assessed different idea units. So, a home buyer is unlikely to be interested in the Colour TV set but concerned about a leaky roof. A burglar is more likely to be interested in just the opposite. When subjects were tested immediately it was found that they recalled almost half of the idea units rated as important from their perspective but only a quarter of the idea units rated as being unimportant, (Pichert and Anderson, 1977; Anderson and Pichert, 1978; Flammer and Tauber, 1981; Fass and Schumacher, 1981).

When compared with this Immediate condition, subjects tested with a delay (Delay condition) showed a higher proportion of recall for idea units rated as important to their perspective than for unimportant ones (Pichert and Anderson, 1977; Anderson and Pichert, 1978; Anderson ,1978).

One interesting aspect of these studies is that perspective shift was given either at encoding or retrieval.

When the perspective given at encoding was shifted at retrieval, subjects were able to re-elaborate the material, i.e. they were able to recall important idea units from this new perspective (Anderson, 1978).

From this studies, it seems that when the appropiate context is given either at encoding or retrieval, subjects have a better performance of recall than when they do not have it.

d) Reader Background.

Everybody has got defined and special areas of interest, experience in different fields such as politics, sports, etc. Such interest and experiences imply a specialized knowledge about these areas from which one has got more facilities to understand and to interpret events in certain ways. So, we may use a sport analogy to describe a political situation.

Such background knowledge can influence our understanding and retention of prose passages. Anderson, Reynolds, Schallert, and Goetz (1977) gave a passage to two groups of students; a weight-lifting and an educational psychology course. Two perspectives of the passage were given to the groups: a planning to escape from prison and a wrestler breaking a hold. After they had read the passage, they were given recognition sentences related to the text. Each sentence had two correct answers, each related to each perspective. Education psychology students scored test performance from the non-dominant perspective (wrestling point of view).

It was found that students from the weight-lifting classes (more familiar with the material than educational psychology students) had over half of the answers correct while educational psychology students had just a quarter.

Other studies (Owens et al., 1979) have shown that the availability of cues related to a passage, could mitigate the disadvantages of those learners with lower levels of knowledge.

Knowledge has a strong influence in making people see the world in a selective fashion.

From the four different contextual situations already described, one common characteristic could be inferred. All

of them provide a structure by which the passage being read a coherent interpretation. The pictorial setting gives a simple framework by which all the pieces can be fitted (balloons popping, flow of electricity, human voice, face to face communication, etc.,) when providing an appropriate title which would activate in the subjects a coherent piece of knowledge. Perspectives can also activate collections of knowledge already stored, (for example, home-buyers versus burglars do). Background knowledge prepares people to organise new information and make it meaningful.

In order to provide a coherent interpretation, people may use their knowledge to make certain assumptions and interpretations, to construct - at the time of initial learning. Bransford and associates, (i.e. Bransford, Barclay and Franks (1972)), called it the constructive hypothesis.

> "From this hypothesis, comprehension involves the construction of meanings and inferences that may differ from the original message". (p. 194)

The difference between Bransford's constructive and Bartlett's reconstructive approach relies on the assumption by the latter that remembering does not only depend on the retrieval of previously stored constructions, so that it would be more like a problem solving situation. As Bransford points out, summarizing Bartlett's position (Bransford, 1979):

> "People remember only the general idea of what was presented and then reconstruct the details according to their expectations of, "What must have been true". They think they are accurately remembering when, in fact, they are not". (p. 158)

Although Bransford and Bartlett disagree on the previous point, Bransford (1979) admits that both reconstructive and constructive processes influence remembering and distortions could be made by either or both processes. However, both authors would then

agree on the concept of schema, although not explicitly made by Bransford until recently (see Bransford, 1979).

It could be assumed that schema or schemata can guide either constructive or reconstructive processes in remembering. At the time of comprehension, for example, information about a home-buyer may activate a "home-buyer" schema, which specifies what particular roles must be fulfilled (such as contract, etc.), and certain sequences of events must occur (such as having an appointment with the estate agent, etc.,). This schematic information is only abstractly specified. So, when one reads a passage, one has to instantiate general variables with particular roles (the process of filling up variables with information is called instantiation of the schema). However, when one schema specifies a variable that is not explicit in a text, subjects have to make assumptions, i.e. to make constructions of it.

From this it can be suggested that schema or schemata are formed at encoding.

Schema or schemata have also been assumed (Anderson, 1978) to be capable of formation at retrieval. It has been previously described that with a perspective shift (Anderson and Pichert, 1977) given at retrieval, subjects were able to re-elaborate the ideas related to that perspective. For example, in a burglary perspective, people had information about the variables that were relevant. These general variables can therefore function as cues that help subjects to retrieve previously experienced instantiations of those variables.

Schemata can also guide reconstructive processes at the time of remembering. When people only remember a general idea,

they reconstruct (i.e. distort the material in Bartlett's sense) the details according to their general knowledge of the world.

III) TEXTS AS HIERARCHIES OF PROPOSITIONS.

a) KINTSCH'S THEORY.

Kintsch (1974) put forward the theory that the meaning of a text can be captured by its underlying proposition content.

His theory has generated a lot of research on comprehension and memory for texts.

His core concept is the text-base. Propositions underlying a passage can be organised into a structure in the mind of the reader. For any given text-base, different surface structures, or texts, can be produced but with the same meaning. As Kintsch (1974) suggested:

> "A text base completely expresses the ideas that the speaker or writer has in mind. The idea itself may, of course, be confused or contradicted, but no noise is introduced in representing an idea in a text base". (p.")

The text base is represented by a list of propositions, corresponding to the ideas organized hierarchically by different levels of propositions. The propositions are formed by a predicator followed by one or more arguments. Simple propositions are embedded by higher-level propositions.

Kintsch suggested dominant propositions of a text will be recalled more readily than low-level propositions, being confirmed with brief passages and longer ones.

Kintsch's theory has been criticised because he does not give a complete explanation of why low-level propositions are remembered less. McKoon (1977) had subjects read a text and presented them with some sentences related to the previous text. Subjects were asked to verify all the sentences immediately after reading, or twenty-five minutes later. She found

that sentences based on propositions high-up in the text base hierarchy were verified faster than sentences low down on it. McKoon concluded that lower-level propositions would be represented less often than higher-ones.

Sanford and Garrod (1981) argued that latency differences might be explained in weakness of lower-level propositions or difficulty in assessing them. If that was the case, it would be a retrieval problem.

b) Story-Grammars.

If a grammar consists of a set of rules which pa ses and defines various components of a piece of language, story-grammar tries to be a device to structure and decompose the various elements or propositions of which a story is made. So, a first rule for a simple story could be rewritten as "Setting + Theme + Plot + Resolution". Each of these components can also be subdivided into smaller units (Rumelhart, 1975; Thorndyke, 1976; Mandler and Johnson, 1977).

Propositions are organised hierarchically, so that those which express the main goal of the story, its outcome and its consequence, would be at the top of this structure, while sub-goals and events expressed by dependent propositions from those of higher-levels would constitute lower-levels in this hier-archy.

In fact, story-grammars are a mixture of grammar-rules dependencies and semantic dependencies, because the use of a goal in a description of a story goes beyond the top-level, as it would be established by a text-base propositional tree.

Thus, a semantically relevant goal might not necessarily be expressed by a grammatically first-order proposition.

By using both dependencies, the gist would come out at the top of the hierarchy. Thorndyke (1976) maintains that the higher-levels should be most readily remembered, so that they would reflect the gist of the story more directly than the lower-levels.

A similar approach has been described by Rumelhart (1975), using the concept of summarization. A summary will emphasize only the important parts of the text which were high up on in the hierarchy, and it will be shorter than a recall protocol.

c) Kintsch and van Dijk's model.

Kintsch and van Dijk (1978) propose a new model which attempts to link text-processing to memory.

In their model, a text will have a microstructure and a macrostructure. In the former, all propositions will be represented as the network, and in the latter only the gist will be represented.

For them, text-processing begins with abstraction of propositional information from the text itself. Then all abstracted propositions are processed and a memory buffer of limited capacity reads a limited number of them. When the next sample of propositions is taken, they become connected to the abstracted ones through argument repetition. With continuous cycles, or intake of propositions, the buffer becomes full, and some propositions are selected to be held in the next cycle. As a result of this process, propositions

become linked as a coherent structure.

Kintsch and van Dijk suggest two different procedures to select those propositions which will be held in permanent memory. The more often propositions are selected to enter into the buffer, the greater their strength would be. Since gist propositions are likely to provide arguments for the integration of new samples, they are also likely to be in the buffer more often and so, to be selected. The second procedure depends on how recently a proposition occurs because in a discourse references are usually made to things which have been presented recently.

According to this type of processing, the greater the number of times a proposition has entered into the buffer, (going up to the macrostructure), the higher is the probability of recall.

In general, all these theories do not make explicit the role of context and its influence in text comprehension and retention. In most of them it could be assumed that a context of a low-level proposition would be represented by a higher-level proposition.

The exception being the schema theories of text processing, where the context does play an important role.

IV) Schema theories.

First of all, it is important to note that not all current theorists use the term schema. Kintsch (1976),and Rumelhart and Ortony (1977) do refer to this concept, while Minsky (1975) uses frames, and Schank and Abelson (1977) refer to scripts.

In all these theories, whether they used schema, frame or script, there is a reference to the many assumptions that a subject needs to make in order to understand a simple story. In other words, they need much more information than can be expressed by the words themselves.

The underlying idea of many of these theories is that schemata, frames or scripts guide the subjects' assumptions to characterize the sequences of the episode.

Within this approach, there is a group of theorists (i.e. Schank and Abelson, 1977) whose main goal is to develop a computer program that could identify and use the scripts (schemata or frames) to comprehend the text inputs. However, the inferences made are arbitrary because of the pre-established limits imposed upon the elaboration of the material.

One of the problems these computer models face is to determine the influence of context on the comprehension process.

In relation to schema or schemata, four characteristics have been described (Rumelhart and Ortony, 1977). First of all, schemata are general entities that can be applied to different situations but containing variables which can be filled up in different ways. The process of filling up these variables has been called "instantiation of the schema". Secondly, schemata can be embedded within other schemata, for example, a face schema itself could be a subschema for a person schema. This characteristic would imply that people organize knowledge of the world in a hierarchical way. Thirdly, schemata vary in their level of abstractness. And finally, schemata are representations of general knowledge that people have about the world.

When people read a text, or a passage of it, the process of its comprehension involves the selection and instantiation of a schema that can account for the information found in a passage. This instantiated schema or fragments of it will be stored in memory and it will be the basis for remembering the passage. If the subject wants to remember the passage at a latter time,he will search for schemata that can account for the remaining fragments in order to provide a meaningful interpretation of these fragments. So, schemata play not only an important role at the time of encoding information into memory, but also at the time of retrieving that information (i.e. Anderson, 1978).

V) METAPHORS AND CONTEXT: IN SEARCH OF A THEORY.

The last four sections of this chapter have been mainly concerned with literal prose, where readers or listeners understand what they read or listened to in a literal way.

However, in both written and oral language, people use language that would not make sense, if taken literally, in relation to the context in which it is said or written. If communication is considered in a broad sense, it would be necessary to take into account these non-literal uses of language in order to build an ecologically valid theory.

One type of non-literal use of language that has recently been taken into consideration has been indirect speech acts. For example, if one was sitting down, and said, "It is cold here !" This person is expecting that somebody gets up and closes the window.

This section is concerned with the use of metaphor, another form of non-literal language. The study of metaphor has been referred to specify utterances, or to similes or analogues. The research has mainly been based on sentences rather than text.

In this section, traditional theories of metaphor are described, and then the relevance of metaphor to psychological theory is pointed out.

a) Traditional theories of metaphor.

Since the time of Aristotle , philosophers have been interested in the nature of metaphor, but little progress

seems to have been made since then, because it might be that although it is easy to "recognize" metaphors, it seems difficult to define them.

Metaphors have been considered the direct substitution of a non-literal phrase for a literal phrase that has the same meaning. This view has been call ed the substitution view. Black (1979) suggested that substitutions have two functions. First of all, people used metaphors for stylistic purposes. Metaphors would have an ornamental function in written language. Secondly, by using metaphors, new terms were coined for new concepts. According to this view, metaphor did not play an important role in the function and development of language.

A special terminology has been used and accepted in the study of metaphor. For many authors (see i.e. Ortony's (1979) recent review), a metaphor consists of two terms and the relationships between them. A metaphorical sentence such as the one used by Verbrugge and McCarrell (1977) shows clearly these terms: "Billboards are warts on the landscape". For comprehending these sentences, subjects would have to determine the, "ground", the shared meaning components of the metaphorical "topic" or "tenor" (in this case, billboards) and the metaphorical "vehicle" (in this case, warts). Some authors (see Richards, in Ortony, 1979) have introduced the notion of "tension" to imply the literal incompatibility of the topic and vehicle.

The most common view of the nature of the metaphor has been that it is a comparison between objects that are literally disparate. This comparison theory comes from Aristotle. He considered metaphor based on analogy with the purpose of making language more elegant rather than meaningful. He can be quoted, "But the greatest thing by far is to be a mastery of metaphor".

Bréal (in Black, 1980) suggested that metaphor was a basic component of language rather than a stylistic device as Aristotle assumed. Bréal claimed that as a result of using metaphors, language might change. Thus, he distinguished between frozen and dead and novel metaphors. The former referred to metaphors that at one time were novel, but through permanent use were integrated into the language, becoming colloquial and idiomatic expressions, (for example the head of state). Novel metaphors refer to a contribution of the power of language.

Other authors (Pollio and Pollio, 1979) suggest that metaphor was more than a block of language as Bréal claimed. Rather, metaphor was the essential transporter of meaning in language. This view, called the interaction theory, emphasized that good metaphors relate the topic and vehicle to produce a resulting meaning that is new and transcends both.

One of the most well-known theorists of this approach is Black (1979), who maintained that the semantic interaction has to be made between the two main components of the metaphor - the topic and vehicle which he called the principal and subsidiary subject. For Black, metaphors work by selecting or suppressing features of the principal subject, and by using features from the subsidiary subject, so that they require subjects to make inferences from them.

This interaction view considers metaphor as a functional rather than grammatical purpose. For the comparison view, a metaphor was a simile or comparison, generally with the adverb, "like" or "as". However, for the interaction view, a true metaphor transforms the elements, so that a new whole is made and then recognized, (producing what Ortony et al. have called the "eureka" effect).

To summarize, metaphors have many functions. They can be devices for linguistic changes as Bréal suggested, permitting a way of communicating things, for example with emphasis, that could not be expressed literally. Following this, some authors (Ortony et al., 1978) have argued that the comparison and interaction theory could be related. Some metaphors imply comparisons or are sometimes used to make a comparison. It is not clear whether metaphors are mere comparisons or if they induce a new way of seeing things. More research is needed to solve this problem.

The research on metaphors has been mainly concerned with the comprehension and production of them, both by children and adults. This section examines only empirical studies into the comprehension of metaphors by adults.

The interest of the review of this chapter is mainly concerned with metaphoric prose, but little evidence has been based on this kind of material. However, the research on metaphors has been concentrated upon sentences or related subjects such as figurative language, i.e. proverbs.

Some of the best studies reported in sentence metaphors were carried out by Verbrugge and McCarrell (1977). For them, metaphors are comparisons, so that in order to comprehend them, inferences have to be made from the ground between the topic and the vehicle. They presented two lists of metaphors and similes to the subjects. One example was, "Billboards are warts on the landscape". "Billboards", is the topic, "Warts", the vehicle and the ground something like, "An ugly protusion on the surface". Topics were held constant for each list, while the vehicles were varied. So, one list might compare, "Billboards to warts", while the other list, "Billboards to

yellow pages on a highway". After subjects had heard the sentences, they were instructed to understand and to think about them. They were given written prompts, and were asked to respond to each prompt by writing the original sentence. Prompts were the grounds, (relevant and irrelevant), topics, and vehicles from the previous sentences.

Verbugge and McCarrell found that both topics and vehicle prompts provided the highest recall followed by relevant grounds prompts. This latter result showed that subjects inferred the implicit ground of a metaphor when an appropriate cue (relevant ground) was available. They proposed that all language, metaphorical or literal, is understood through elaboration processes that are constrained by the context.

In other series of experiments (i.e. Ortony et al., 1978) reaction times were measured for understanding target sentences or phrases in terms of a preceding context. Each target sentence could be interpreted either literally or metaphorically, depending upon the context which preceded it. A target could appear either after a short or a long version of either a metaphorical-inducing or a literal-inducing context. They found that only in the short context condition, subjects took significantly longer to understand metaphorical rather than literal targets.

Recently, Denis Hilton (1982) had examined whether metaphors affect economic thinking and policy choice in people. Subjects were asked to write the concluding paragraph of an article which supposedly they had been commissioned to write on British economics, using as a title either, "Britain's economy: an unhealthy body in need of a cure", or, "Britain's economy: an unhappy famil y in need of cure". The article should communicate economic ideas on the four main target variables;

inflation, unemployment, balance of payments and economic growth. He found that subject who had used the "body" analogy gave priority to inflation, while subjects who had utilized the "family" analogy considered unemployment and growth as more important variables.

b) The relevance of Metaphor for psychological theory.

During the last decade, cognitive psychology has not considered the study of metaphor sufficiently important. But recent theories (see Billow, 1977; Ortony et al., 1978; Ortony, 1979, for reviews) have been concerned with metaphors for studying human comprehension and memory.

First of all, propositional models, (Kintsch, 1974), characterized by the representation of knowledge and the consideration of sentences as propositions have treated metaphors as semantic anomalies. Kintsch proposed that a metaphor would be an anomalous input string and, therefore, a comparison. His mode requires a two-stage process.

In the first stage, subjects would impose a literal meaning in a sentence, which presumably would fail, in the second stage subjects would attempt to recover from the error. On the other hand, Searle (1979) suggested that processing metaphors require a three stage process. In the first stage, the reader would determine that the sentence is defective. So, he must process the literal meaning of the sentence to take this defective decision. Secondly, when he fails to comprehend the sentence in the context, he would have to give some alternative meaning and, finally, he would process it in a metaphoric way.

In these propositional models, because metaphors are

treated as semantic anomalies whose recognition would impose a reinterpretation of them, it should be postulated different processes for metaphors.

Secondly, schema theories, (Rumelhart and Ortony, 1977; Ortony et al., 1978; Rumelhart, 1979) proposed that knowledge of the world is represented in a more flexible manner than propositional models claimed. For instance, in a propositional model, the meaning of a word like cow would say that it is a mature female cattle, because word meanings are represented as propositions about the core meaning. However, for a schema theory, cow is domesticated, it provides milk etc .,because schema can be formed by different variablesrelated to each other. Some values of the variables are more "typical" (in Rosch's sense, 1973) than others.

This kind of representation system seems to be more flexible to match information from a non-literal use of language to stored knowledge. People might interpret metaphors by finding a schema or schemata that would match the sentence or ideas of a text.

To illustrate the schema theory in relation to the comprehension of metaphor, Ortony et al., (1978) presented the following passage:

> "Severe criticisms of Europe's oldest dictator came from within Spain and without. For 35 years Franco was barraged with these constant criticisms. To the end, the struggle continued between the ruthless dictator and his critics".
> (Ortony et al., 1978, p.474).

Ortony et al., (1978) suggested that when people read this passage, they have to activate several schemata in order to comprehend it. These activated schemata, could be: Franco, dictator, Spain, criticism etc . If subjects were presented with the following target after they have read the

text: "The waves beat relentlessly against the rugged coastline". The text would have generated expectations that the target which followed it would be accounted for in terms of these schemata.

Schema theories assumed that they had to find the best possible account of any input, either sentence or ideas in a text. Thus, a metaphor would result from the same process as literal language. As Ortony et al., (1978) suggested:

> "In the normal course of events non-literal uses of language, be they metaphors, are comprehended without any special processing. The predominantly top-down strategy that is employed in language comprehension enables them to be comprehended in terms of the preceding context quite naturally. On the other hand, there certainly are cases where utterance is insufficiently related to the context for it to be understood. These cases included literal as well as non-literal uses of language. In such cases, it is necessary to engage in additional inferential procedures".
>
> (Ortony et al.,1978,p.476)

From this it seems that the additional inferential procedures, suggested by Ortony et al., (1978) would involve more elaborations on the material or a deeper processing.

This idea of stronger elaborations could be related to the "levels of processing" approach (Craik and Lockhart, 1972; Craik and Tulving, 1975; Craik and Jacoby, 1975; Cermak and Craik, 1978; Jacoby and Craik, 1978; Craik, 1981) to account for metaphors.

The levels of processing's claim is that incoming information is determined by operations performed during the input time, rather than by transformations of information from one store to another (see A tkinson and Shiffrin's model of different types of stores, 1968). The input operations are called perceptual-conceptual analysis, which may include both sensory and semantic analysis. The outcome of perceptual-conceptual analysis is a code, and, therefore depending on

the point of this contin um different sorts of code will result. Memory will depend on the nature of the code, and so different codes have different permanence. Codes of sensory aspects of the input (shallow processing) are less durable than semantic ones (deep processing).

The main prediction of this theory is that people will recall more words which are deeply processed than shallowly. Craik and Tulving's results supported this prediction.

Efforts have been made to extend the levels of processing approach to situations involving everyday-cognition. Mitsler-Lachman (1972) presented ambiguous and unambiguous sentences in order to study their influence in comprehension. The ambiguous sentences have more than one meaning. (e.g. They are shooting stars). Three different depths of processing were manipulated. At the shallowest level, subjects only viewed target sentences and were asked to judge whether or not each target was meaningful. At the intermediate depth level, subjects were asked to judge whether a target sentence followed a context sentence. At the deepest level, they were asked to make up a sentence to follow the target sentence. She found that ambiguity affected the time of judging the meaningfulness of a sentence (shallowest level) less than that of generating a sentence (deepest level).

Schallert (1976) presented ambiguous passages, giving subjects different titles that suggested different meanings. Levels of processing were varied in 4 different ways: subjects counted four-letter word, personal pronouns, they rated the passages" ambiguity, or they tried to learn the passages. Following these incidental tasks, they were given an unexpected recall test, and a multiple-choice test about

the paragraphs. She found that subjects recall more of the passage when they tried to learn than in the other conditions. Title manipulations affected depth of the task, that is, situation where they have to judge ambiguity or learn the passage.

Both findings (Mistler-Lachman, 1972, and Schallert, 1976) supported the levels of processing view for meaningful material. However, they did not imply that only semantic processing was deep, because shallow semantic processing seemed possible.

Craik and Tulving (1975) suggest that these results could be accounted for semantic elaboration in the sense that the more semantic elaboration were coded at input, the more ideas recalled there should be.

Much in the same way, Anderson and Reder (1979) related the concept of semantic elaboration to a model of comprehension. They showed that more elaborations at encoding could establish more retrieval cues in the permanent memory structure, and, therefore a better recall performance. They concluded that:

> "What most impresses us about elaborative processes is that they seem to provide a mechanism for producing powerful effects in the overall level of recall. Although measurements using reaction time - as in Reder's experiment, are often theoretically more sensitive, the striking effect should be seen in percent recall, our respective research endeavours in this area are aimed at discovering what manipulations can increase the amount of relevant elaborative processing that a student can do for prose material, and whether these manipulations have their anticipated effects on percent retention ... Elaborative processing that also facilitates retention is naturally associated with the studied material. The act of elaborating text is basically "exercising" the reader in thinking about the content".
>
> (Anderson and Reder, 1979, p.401).

These elaborations processing could clearly be shown in comprehending and remembering metaphoric text. If that is the case, levels of processing, mainly elaborations, could be

related to metaphors.

VI) RESEARCH ON MEMORY FOR PICTURES IN RELATION TO TEXT PROCESSING.

Research on remembering pictures comes from the time of Bartlett (1932). He asked subjects to reproduce geometrical forms and figures or meaningful pictures. Bartlett's explanation of his findings was in terms of schema theory, described in the first section of this chapter.

As Baddeley has pointed out (1976):

> "Bartlett's work on the recall of pictures has been largeley neglected, and yet his technique of cued recall, in which he would ask the subject for specific details (e.g. "What, if anything, was the sailor smoking ?"), would allow a much finer analysis of visual memory than is typically obtained in many current studies". (Baddeley, 1976, p.14).

From then, the research has been mainly concerned with visual codes in the two different stores of the memory system, using a non-meaningful material.

In the decade of the seventies, mental imagery was reintroduced into psychology and a long debate has been maintained since.

Paivio (1971, 1978) has advanced a dual-coding hypothesis to account for the data on imagery. He postulates two separated and different systems for verbal and non-verbal information. The former deals with linguistic units and the latter with visual material, mainly pictures. The two systems communicate with each other, because words can be transformed into images, and images into words.

Against Paivio's dual-coding hypothesis, some theorists (Anderson, 1976, 1980; Anderson and Bower, 1973; Friedman,1979; Pylyshyn, 1973) have proposed a single representational format for both pictorial and verbal information.

This unique code consists of information represented in terms of propositions so that, only the meaning of an event is represented, while the unimportant details are not. For this approach, the proposition is the smallest unit of knowledge. Propositional analysis applies most clearly to linguistic information but it has also being suggested to represent the meaning of a picture.

One source of experimental evidence for this unitary view of visual and verbal coding relies on the studies of Mandler and associates (Mandler and Johnson, 1977; Mandler and Parker, 1976; Mandler and Ritchey, 1977) showing that meaningful interpretations of pictures are stored in permanent memory.

Mandler presented organized and disorganized versions of a classroom scene to subjects to see whether a meaningful picture could be interpreted in terms of what she called scene schema. (Knowledge stored in subjects' permanent memory). She found that subjects' recall of objects in meaningful pictures was better than of objects in non-meaningful disorganized pictures. For Mandler, the subjects' schema for a classroom scene would imply a teacher, pupils at their desks, etc... When they are presented with a meaningful picture of a classrooom it would fit in with the schema in their permanent memory.

The representations proposed by the unique-code models would be of an abstract kind which could neither be called visual or verbal. If subjects were asked for

a verbal recall of pictorial material, it could be expected they would code it verbally. However, Mandler's results were based on a visual recognition task, and consequently they support an abstract format of representation for this type of material. From her work, it can be concluded that schema or schemata could also guide the comprehension and retention of visual events (Bransford, 1979; Goodman, 1980).

Another set of experiments on memory for non-meaningful pictures, that support the unitary view, comes from the studies by Bower, Karlin and Dueck (1975). They presented subjects simple drawings with or without an explanation of their meaning (they called these pictures "droodles"). Subjects were asked to study the droodles and later to reproduce what they remember of the pictures (to redraw them). When subjects were given the pictures without labels, their later reproduction was very poor. But with labels memory performance improved.

The last evidence to report in this section, supporting the unitary view comes from Nelson, Metzler and Reed' s (1974) study. They presented a scene which was represented by a photograph, a one-phrase description of it, a detailed or non-detailed drawing of the photograph. After subjects viewed one of these four stimuli, they had a recognition task.

Nelson et al., found that recognition performance for any of the three pictorial stimuli was better than for the verbal descriptions. No difference between pictorial information were found. They explained their results in terms of a similar and abstract interpretation, by the subjects, of either detailed or non-detailed pictures.

It is important to point out that these three sets of experiments stressed the meaning for pictorial material in contraposition to the material used in the sixties.

Recently, research concerning the role of pictures as prose-learning devices has come out (see Levin, 1981). Levin points out four main functions of prose-learning pictures. First of all, a text could be equivalently expressed by a sequence of pictures, so that these could be redundant to the verbal information in the passage. When that is the case, pictures serve to <u>represent</u> the text. Secondly, pictures, (i.e. a map), that enhance the relatedness of textual elements could serve as an <u>organized</u> function. Thirdly, pictures could be used to increase the meaningfulness of the information to be processed, serving as an <u>interpretation</u> function. Finally, <u>transformation</u> function will serve to produce a physically different text as encoded.

Levin related these four function with Kintsch and van Dijk's distinction of macrostructure and microstructure levels. At the macrostructure level, the interpretation function would enhance the meaningfulness of the test at comprehension, while the organization function would improve the relatedness of the ideas in the text at recall. At the microstructure level, the

same function (interpretation) would work at comprehension while at recall both representation and transformation functions might enhance concreteness and memorablility respectively.

CONCLUSIONS.

Early theories on prose processing (Bartlett's) approach have implicitly considered the role of context on prose processing. The only modern theory which has manipulated the context explictly has been the constructive approach (Bransford), either with pictorial setting, title, perspective shift or reader's background. An attempt to account for the influence of context in literal prose processing has been the schema theory.

Recently, psychology has become interested in the comprehension and retention of metaphors, where context also plays an important role. But metaphors are not yet well defined and there is not agreement on their theoretical explanations. Some of these have been made in terms of schema theories and semantic elaborations (deep processing).

Memory for pictures has mainly been concerned with everyday life settings during the last decade, providing a strong support to the view of a unique abstract representation code, for both verbal and visual information.

Pictures have proved to be an important device to illustrate a prose. Bransford and Johnson (1972) studied the conditions under which a picture enhances the comprehension and recall of a passage. Although they found that the presentation of a picture before a text would help both processes, they did not consider the simultaneous presentation of both materials as most people would have to process in everyday life,(i.e. reading a newspaper, watching a film etc.). This particular condition has been considered in all the experiments of this thesis, while Bransford and Johnson's

study is extended in the experiment of the next chapter.

EXPERIMENTAL STUDIES ON MEMORY FOR PROSE

CHAPTER II

THE ROLE OF CONTEXT IN RECALL: BEYOND BRANSFORD AND JOHNSON

I) INTRODUCTION

As previously reviewed in the last chapter, Bransford and collaborators (Bransford and Johnson, 1972, 1973; Bransford and Franks, 1976; Bransford and McCarrell, 1974, 1977; Bransford, 1979) proposed a "Constructive Processing" approach to encode a text. They postulated that general meanings and relationships are stored and integrated into an individual's knowledge structure. The meaning of the text is constructed from other knowledge together with the words presented. So, comprehension plays an important role in remembering a text. When the text is comprehended well, recall is better. The effects of comprehension on recall were related to the concept of a "Schema" or "Schemata" in processing prose materials.

It has been assumed that the intake of information, and therefore the process of comprehension, depends upon and is guided by the schemata brought by the subjects

to the task. The constructive processing approach postulated that construction occurs only at encoding (Bransford and Johnson, 1972; Dooling and Mullet, 1973). But experiments show that it also occurs at retrieval (Anderson and Christiaansen, 1977).

The Experiment reported is an extension of Bransford and Johnson (1972, Experiment I) where the aim was to examine the role of prior knowledge in the encoding of (extra) information. Their task is frequently cited as strong evidence for the critical role of Contextual Knowledge in the encoding process, (Bransford, 1979; Klatzky, 1980; Moates and Shumacher,1980, etc...).

Bransford and Johnson (1972) had subjects listen to a text which was nearly incomprehensible without looking at a picture.Their conditions were; Without Context, Without Context repeated (text presented twice),Context After,Context Before,and Partial Context. They found that pictorial information can influence the interpretation and the retention of passages.

It has been frequently reported in the literature (e.g, Klatzky, 1980) that repetition enhances recall, although most of the material being used were lists of words or digits. So it seems reasonable to replicate Bransford and Johnson's condition where subjects were presented with the text twice. But, since in most real life situations contexts (i.e. pictorial setting) are

simultaneously contingent with verbal information, it was felt that Bransford and Johnson' s experiment should be extended to include a Simultaneous condition where both informations were presented at the same time.

Furthermore, it was hypothesized that the influence of either pictorial information or repetition of the text on recall might be a function of the retention interval. So, delayed conditions were also added to the design for both types of presentations.

II) METHOD

SUBJECTS

The subjects were 192 male and female students who volunteered to participate in the experiment. They were 99 male and 93 females. Their ages ranged from 18 to 35 years old, with a mean of 24.10 years old. They were tested in groups of 24.

Materials

The passage was the same as the one used by Bransford and Johnson (1972), translated into Spanish. (Table I). It was presented on tape. The picture used is shown in Figure I. It was an enlarged drawing on a cardboard display of 120 x 80 cm.

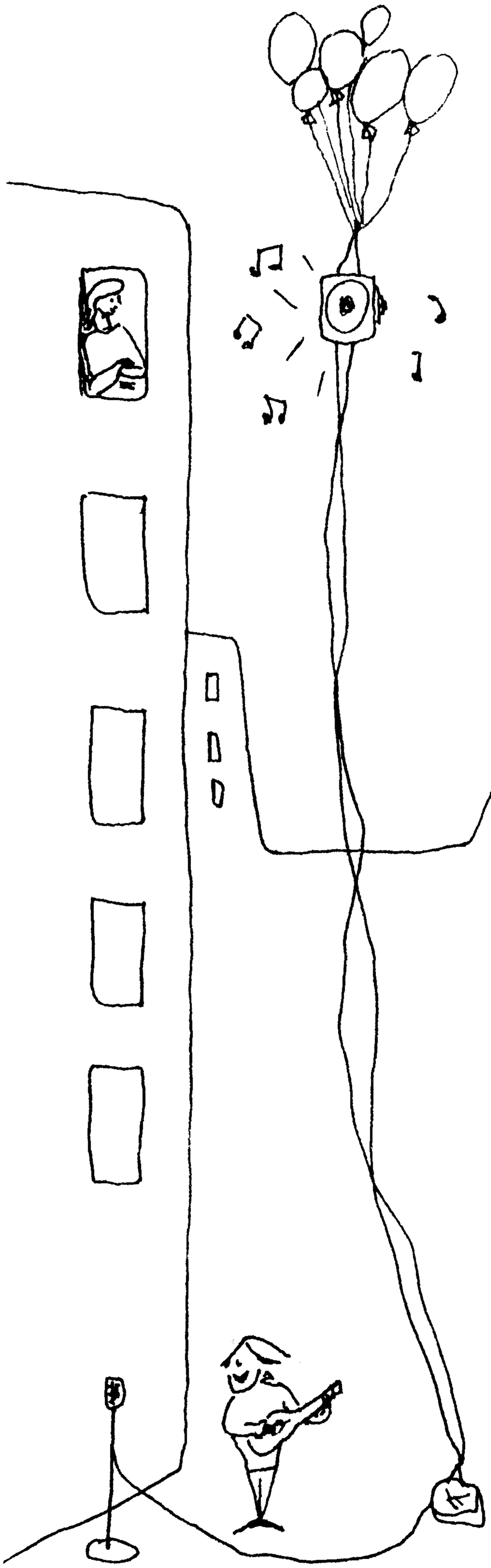
Procedure

The experiment consisted of a learning phase, followed by two tasks, difficulty rating and recall. There were eight independent conditions of subjects, with 24 per group. In the first condition, Without Context (WC1) the subjects only heard the passage once without the picture and were tested immediately. In the Without Context (2) Immediate (WC (2) 1) condition, the subjects heard the text twice without the picture, and were then tested immediately. The Without Context (2) Delayed (WC (2) D) condition differed from WC (2) 1 only in that the subjects were tested 24 hours later. In the fourth condition, Context After (CA), they first heard the passage and then they saw the picture. In

TABLE I

PASSAGE USED IN THE EXPERIMENT TRANSLATED INTO SPANISH.REPRINTED WITH PERMISSION.

If the balloons popped,the sound wouldn't be able to carry since everything would be too far away from the correct floor.A closed window would also prevent the sound from carrying,since most buildings tend to be well insulated.Since the whole operation depends on a steady flow of electricity,a break in the middle of the wire would also cause problems.Of course,the fellow could shout,but the human voice is not loud enough to carry that far.An additional problem is that a string could break on the instrument.Then there could be no accompaniment to the message.It is clear that the best situation would involve less distance.Then there would be fewer potential problems.With face to face contact,the least number of things could go wrong.



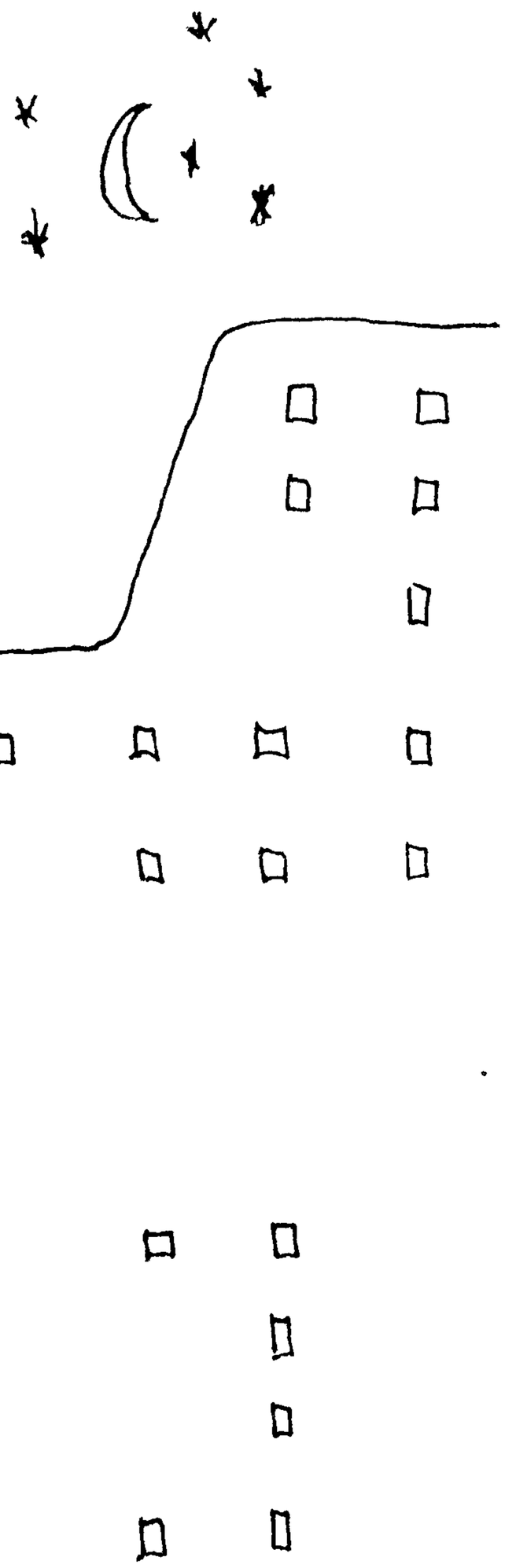


FIGURE I

APPROPRIATE CONTEXT PICTURE. REPRINTED WITH PERMISSION.

the Context Before (CB) it was just the opposite; they first saw the picture, and then heard the text. In the Simultaneous Context Immediate, (CSI), they heard the passage and saw the picture at the same time, and they were then tested immediately. In the Simultaneous Delayed (CSD), the only difference from CSI was that they were tested 24 hours later. Finally, The Without Context, plus Context Simultaneous (WC+CS I condition) they heard the passage without the picture, and then they heard the text again, at the same time as they saw the picture, they were then tested immediately.

All the subjects were told that they were going to hear a tape-recorded passage, and were asked to try to comprehend and recall it. They were told that they would later be asked to recall the passage as accurately as possible.

In the WC+CSI, CB conditions the subjects were given 30 seconds* to look at the picture before the passage started. In the CA condition they had the same amount of time to look at it after the passage finished. In the CSI and CSD they had the same amount of time to look at the picture as the recording passage lasted (approximaly te sixty seconds).**

After the learning phase was finished, a seven-point scale was used to rate the difficulty of the passage, with 1 indicating that the passage was very difficult to comprehend, 4 moderate, and 7 very easy.

(*) As in Bransford and Johnson's(1972) original experiment.
(**) Extra exposure time for picture was given to compensate for time to scanning the text.

The learning phase plus difficulty rating of the passage lasted about 2 minutes. In the recall task the subjects were asked to remember the passage as accurately as they could, and were encouraged to try to write down as many ideas as possible. They were given seven minutes for the recall task. After this time, they were asked in the Without Context, Context After and Before conditions, to write down briefly the situation that they had imagined when they heard the passage without the context (picture). The Before condition was included in order to check that subjects did not recall details of the picture, but they understood the whole picture.

III) RESULTS

The procedure for scoring recall was as follows: two judges designated a priori idea unit, corresponding to either of the individual sentences, basic semantic propositions or phrases. Maximum score was 14 units (see Appendix I). Bransford and Johnson did not report their idea units. But because the number coincided, it was assumed that they were the same. Paraphrases were allowed. Interjudge's reliability was, .84 (Pearson correlation). When there were differences between the two judges, in relation to the assignement of the scores, a third judge was introduced. To analyse the data the scores of the third judge were used when these differences existed.

A) Quantitative analysis

Mean difficulty ratings and mean number of ideas recalled with their corresponding standard errors for each condition are shown in Table II together with Bransford and Johnson's. As one can see, subjects seem to rate the task more easy in the conditions where they had been shown the context (seeing the pictures) than without it. However, recall seems to be higher in the conditions where they had heard the passage twice or had the context Simultaneously or Before, in the experiment reported in this chapter.

For rating of difficulty and recall the Dunnett's test (Keppel, 1973) was used to compare Context Simul-

TABLE II.

MEAN NUMBER OF IDEAS RECALLED AND MEAN RATING OF DIFFICULTY OF THE TASK.

CONDITIONS	RECALL[a]				RATING OF DIFFICULTY OF THE TASK[b]			
	$\bar{X}$		ST.ERROR		$\bar{X}$		ST.ERROR	
WITHOUT CONTEXT(1)	4.70	(3.60)[c]	0.44	(.64)	2.45	(2.30)	0.40	(.30)
WITHOUT CONTEXT(2) I	6.37	(3.80)	0.39	(.79)	3.95	(3.60)	0.37	(.27)
WITHOUT CONTEXT(2) D	4.00		0.36		3.29		0.27	
CONTEXT AFTER	3.87	(3.60)	0.36	(.75)	3.66	(3.30)	0.44	(.45)
CONTEXT BEFORE	6.66	(8.00)	0.47	(.65)	5.54	(6.10)	0.38	(.38)
CONTEXT SIMULTANEOUS I	7.25		0.38		5.66		0.29	
CONTEXT SIMULTANEOUS D	5.45		0.40		6.16		0.19	
WITHOUT CONTEXT plus CONTEXT SIMULTANEOUS	7.62		0.36		4.69		0.44	

[a] Maximum score for recall: 14 idea units.

[b] Maximum score for rating of difficulty: 7 points.

[c] Bransford & Johnson's results in brackets.

taneous Immediate with each of the seven conditions. The choice of this condition as the controlling factor was based on the fact that one could presuppose that it might be one of the best conditions. This post-hoc test (Dunnet's) was chosen because Bransford and Johnson's did also use it, and linear comparison wanted to be carried out.

In rating of difficulty the Dunnett's test (Table III) showed that Context Simultaneous Immediate was significantly higher than Without Context (1), Without Context (2) I, and Without Context (2) D, and Context After, (d (8,184) 3.18, p(o.005), but it was not significantly different from Context Before, Context Simultaneous D and Without Context and Context Simultaneous. Proportions of rating of difficulty are plotted in Figure II, with the same conditions as Bransford and Johnson, whose results are also plotted on this figure to allow comparisons. The pattern of results was quite similar.

In recall, Dunnett's test (Table IV) showed that Context Simultaneous Immediate was significantly better than Without Context (1), Without Context (2) D, Context After, and Context Simultaneous D (d (8,184) 2.93, p 0.01), but it was not significantly different from Without Context (2), Context Before and Without Context, plus Context Simultaneous Immediate.

Proportions of recall were plotted for the same conditions used by Bransford and Johnson (Figure III).

TABLE III.

DUNNETT TEST FOR RATING OF DIFFICULTY OF THE TASK.

SOURCE OF VARIATION	SS	df	MS	F
CONDITIONS	282.48	7	40.35	12.09**
ERROR	613.84	184	3.33	

CONTROL CONDITION=CONTEXT SIMULTANEOUS IMMEDIATE.COMPARISONS OF THE SEVEN CONDITIONS WITH IT.

CONTROL AND WITHOUT CONTEXT(1)	t=4.24**
CONTROL AND WITHOUT CONTEXT(2) I	t= 3.23**
CONTRCL AND WITHOUT CONTEXT(2) D	t=4.50**
CONTROL AND CONTEXT AFTER	t= 3.79**
CONTROL AND CONTEXT BEFORE	t= 0.23
CONTROL AND CONTEXT SIMULTANEOUS D	t= 0.94
CONTROL AND WITHOUT CONTEXT + CONTEXT SIMULTANEOUS	t= 1.84

** p<0.01

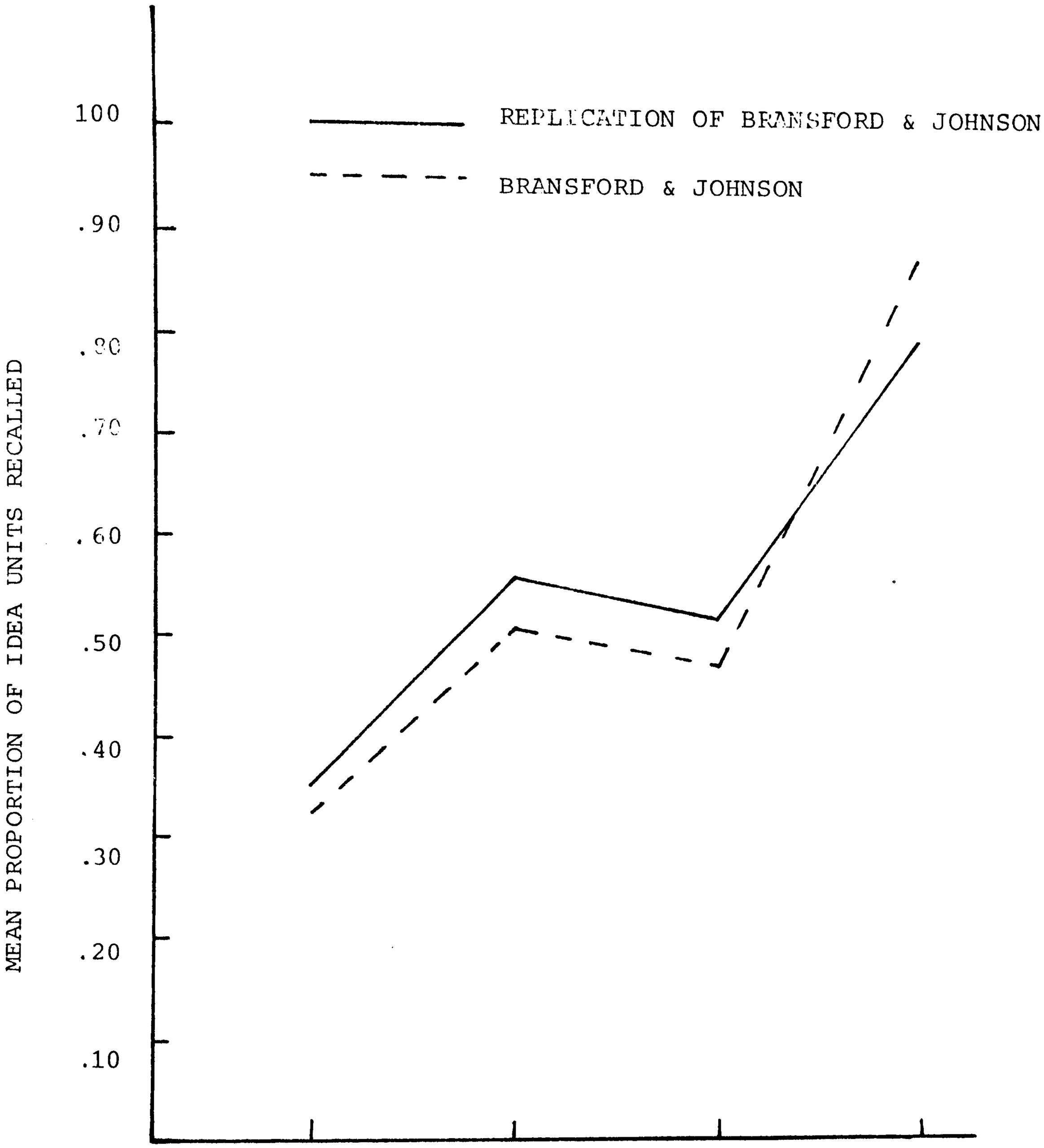


FIGURE II.

MEAN PROPORTIONS OF RATING OF COMPREHENSION

TABLE IV.

DUNNETT TEST FOR RECALL

SOURCE OF VARIATION	SS	df	MS	F
CONDITIONS	353.87	7	50.56	11.76**
ERROR	790.63	184		

CONTROL=CONTEXT SIMULTANEOUS IMMEDIATE.COMPARISONS OF THE SEVEN CONDITIONS WITH IT.

CONTROL AND WITHOUT CONTEXT(1)	t=4.24**
CONTROL AND WITHOUT CONTEXT(2) I	t= 1.46
CONTROL AND WITHOUT CONTEXT(2) D	t= 6.26**
CONTROL AND CONTEXT AFTER	t= 6.11**
CONTROL AND CONTEXT BEFORE	t=1.00
CONTROL AND CONTEXT SIMULTANEOUS D	t=2.99**
CONTROL AND WITHOUT CONTEXT + CONTEXT SIMULTANEOUS	t=0.62

* p<0.05
** p<0.01

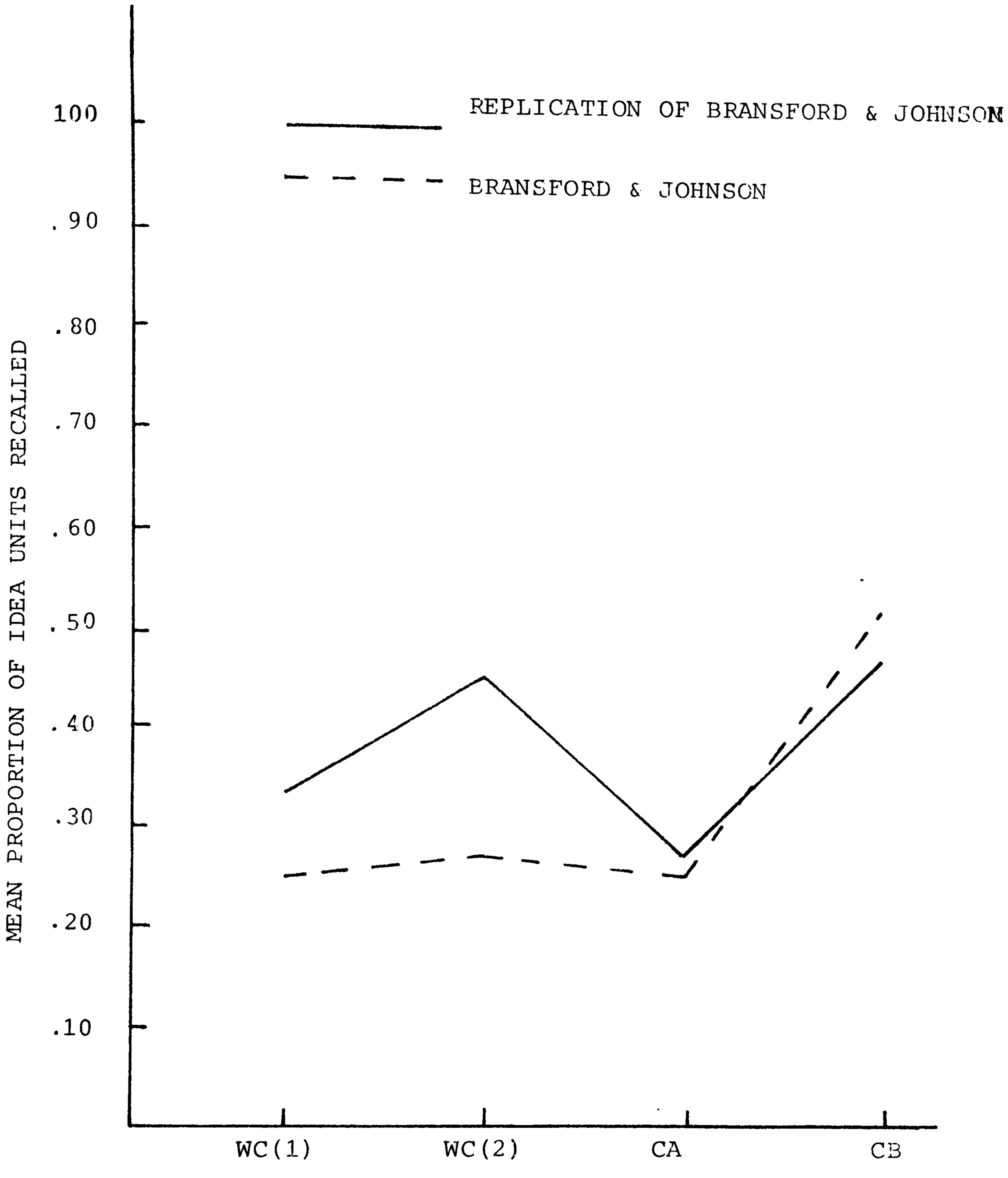


FIGURE III

MEAN PROPORTIONS OF IDEAS RECALLED

The pattern of results are quite similar in Context Before and After, but quite different in Without Context (1) and (2) . (See Table II).

A Pearson correlation was computed between overall recall and rating of difficulty ($r = .23$, $p < 0.005$). The correlation, although positive, was quite low.

A 2-way analysis of variance was carried out on the data from only four independent conditions; Context (Without and Simultaneous) and Testtime (Immediate and Delayed) both on rating of difficulty and on recall.

In rating of difficulty (see Table V), the main factor Context was highly significant ($F(1, 92) = 58.99$, $p < 0.001$). Neither Testtime nor the interaction were significantly better than in the Without Context (see also Figure IV). Context Simultaneous was significantly higher than Without Context (see Table II).

In recall (see Table VI), Context ($F(1, 92) = 8.74$, $p < 0.01$) and Testtime ($F(1, 92) = 27.85$, $p < 0.001$) were highly significant but the interaction was not (see also Figure V). Context Simultaneous was significantly better than Without Context, and Immediate was significantly higher than Delayed (see Table II).

TABLE V.

ANALYSIS OF VARIANCE FOR RATING OF DIFFICULTY OF THE TASK IN THE CONDITIONS OF WITHOUT CONTEXT (2) AND CONTEXT SIMULTANEOUS AT IMMEDIATE AND DELAYED.

SOURCE OF VARIANCE	SS	df	MS	F
CONTEXT	126.04	1	126.04	58.90***
TESTTIME	0.17	1	0.17	0.08
CONTEXT X TESTTIME	8.17	1	8.17	3.82
RESIDUAL	196.58	92	2.14	

*** $p < 0.001$

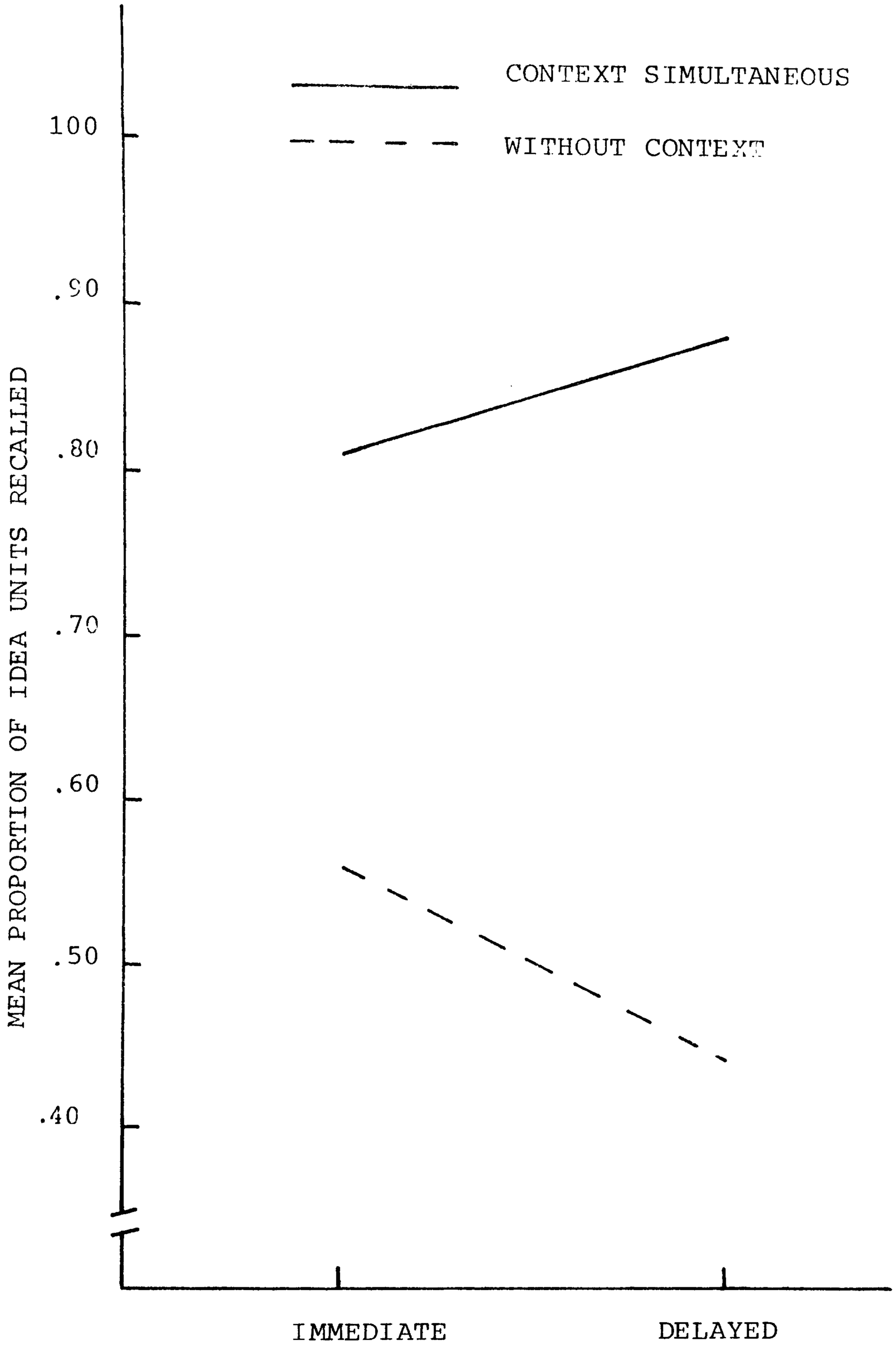


FIGURE IV

MEAN PROPORTIONS OF RATING OF DIFFICULTY.

TABLE VI

ANALYSIS OF VARIANCE FOR RECALL IN THE CONDITIONS WITHOUT CONTEXT(2)AND CONTEXT SIMULTANEOUS AT IMMEDIATE AND DELAYED CONDITIONS.

SOURCE OF VARIATION	SS	df	MS	F
CONTEXT	32.67	1	32.67	8.74**
TESTTIME	104.17	1	104.17	27.85***
CONTEXT X TESTTIME	2.04	1	2.04	0.55
RESIDUAL	344.07	92	3.74	

** $p<0.01$

*** $p<0.001$

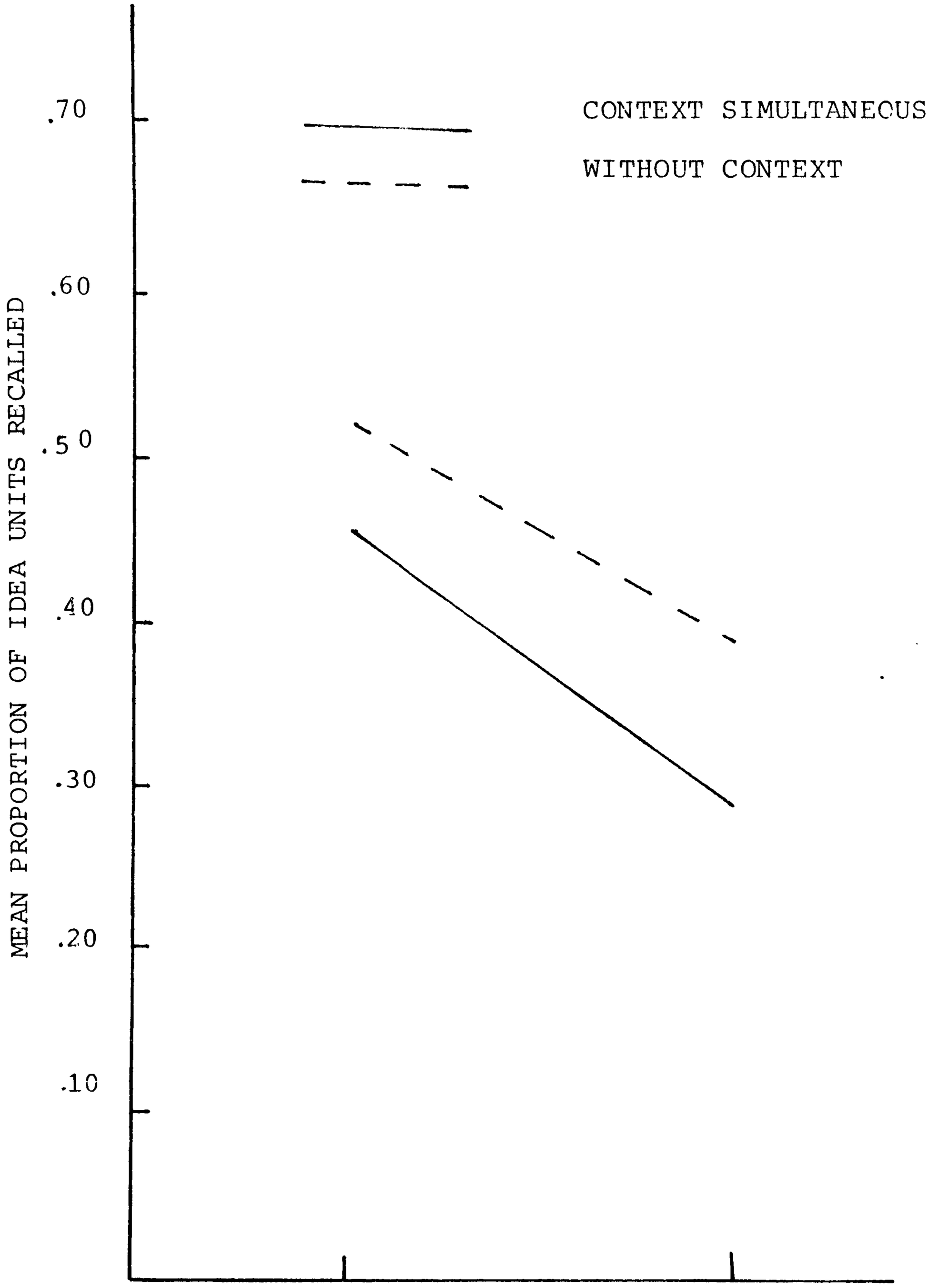


FIGURE V.

MEAN PROPORTIONS OF IDEAS RECALLED

B) Qualitative analysis.

Under this heading, reports given by the subjects on the situation imagined are described as well as the characteristics of the text recalled in each of the conditions.

B. 1.) Reports given by subjects about the situation imagined when they did not have the picture at the time they heard the passage,or when they have the picture before they heard the passage.

WITHOUT CONTEXT (1)

(Subject 2): "I thought it deal with the demos-tration of a new apparatus, but everything was mixed and without sense. That is, the text had not got any sense. I had to construct the story of the apparatus".

WITHOUT CONTEXT (2) I

(Subject 7): " A sound technician tries to ex-plain the conditions where some failings could be produced in any hearing. The problem could not be

only technical, but also of distance. He explained it clearly."

WITHOUT CONTEXT (2) D

(Subject 5) "I imagined a building with two people, men, who were talking or solving problems on an electrical apparatus. Finally, the solution was to agree that the communication between two people was without distance".

WITHOUT CONTEXT AND CONTEXT SIMULTANEOUS

(Subject 6) "It could be a checking sound room. It was about the transmission of sounds in relation to distance, and the problems implied by it".

CONTEXT AFTER

(Subject 14) "It dealt with a show. There were practical problems in the rehearsal. Problems related to the sound".

CONTEXT BEFORE

(Subject 2) "When I first saw the drawing I concentrated on understanding it as a whole, and then on details: number of windows, stars, etc:"

B.2. Characteristics of text recalled for each condition.

WITHOUT CONTEXT (1)

Subjects recalled the same sentences as the ones used in the passage. There was telegraphic speech, (many full stops). The recall of text was not structured or organised. They did not use paraphrases.

WITHOUT CONTEXT (2) D

Most of the subjects seemed to remember the first and last sentences. They remembered general ideas such as distance, communication problems etc:

WITHCUT CONTEXT+ CONTEXT SIMULTANEOUS

They recalled some sentences similar to the text,but they also used paraphrases.Tey seemed to understand the whole situation.The text was structured and organized.

CONTEXT AFTER

The sentences recalled were quite similar to the text. Few subjects inverted the sentences.The majority of subjcets did not understand the whole situation.

CONTEXT BEFORE

Subjects used paraphrases.They understood the whole situation.The recalled text was structured and elaborated. Few subjects mixed passage and picture.

CONTEXT SIMULTANEOUS I

Subjects recalled cause and effect.Their recall was quite structured and organized.They used paraphrases.They related text to the picture,understanding the whole situation.Their comprehension seemed to be good.

CONTEXT SIMULTANEOUS D

Subjects also related cause and effect.The majority of them recalled the ' moral message '(face to face communication).They used paraphrases.It semed that they organized the text from what they remembered from the picture.

IV) DISCUSSION

For the conditions that were the same as those used by Bransford and Johnson the same pattern of results was obtained for "comprehension difficulty" but not for recall scores. Repetition of text without an appropriate context improved recall.

Subjects do not seem to rate their own difficulty with the text. Instead they seem to make an 'abstract' judgement of it without implying how they have understood it. For example subjects rated the text very difficult in Without Context (1) I condition and their recall was higher than Context After where they rated it easier than the last one. One should expect to find a high negative correlation between difficulty rating (comprehension difficulty) and recall. But the correlation found was low and positive. Bransford and Johnson (1972) did not report any correlation between comprehension and recall. This method of evaluating subjective rating of difficulty was not very valid, because it was not clear whether subjects rated their own effort to understand it, difficult text, etc.

With regard to recall the pattern of results was quite different. When subjects heard the text only once, they seem to remember it better than Bransford and Johnson's results. When they heard the passage twice, they were able to remember it well. Although they said that it was difficult, they were able to

comprehend some independent ideas without grasping the whole situation (see verbal reports given in this condition). This phenomenon of enhancing recall with repetition has been found to apply to words. (Craik, 1981; Crowder, 1976; Glass, Holyoak and Santa, 1979, for reviews), words in sentences (Manelis and Yekovich, 1976) and prose (Kareev, 1981, in children; King, 1978, 1979; Howe, 1970; Rothkoft, 1968; Meyer and McKonhie, 1973, in adults). Although these results were found when the text was easy to understand and no picture was needed to follow it, Bransford and Johnson (1972) did not find this effect when they repeated the passage to the subjects. It is true that the experimental situation was different, because subjects needed the picture as additional information to form the "appropriate context" in order to be able to understand the whole situation. It might be that when the text is repeated it helps subjects to form a 'schema' and to be able to make more elaborations on it. If that is so, the schema might be formed at encoding. But when subjects were tested twenty-four hours later, their performance dropped because the text was not completely organized and elaborated.

Bransford and Johnson's experiment differed from the present experiment in the languages used, English versus Spanish, but the number of words was approximately the same, and in the populations. One should not expect

to find different results due to transcultural factors.

The Context Before group showed a better performance than when subjects heard the passage once, or when they heard it before seeing the picture as found by Bransford and Johnson. The picture provided an appropriate knowledge framework, or context, to recall the text.

Looking at the conditions introduced in this experiment, when subjects could listen to the text and look at the picture at the same time (control condition), their performance improved but it did not differ significantly from the conditions where subjects had already formed a schema (Without Context (2), Context Before, and Without Context + Context Simultaneous). It seems that with this kind of material, Context Simultaneous was not the best situation for recalling the text, although subjects seem to have better elaborations than in the Without Context (2), because recall did not deteriorate so much over time although the interaction was not significant.

The last condition to be discussed is Without Context + Context Simultaneous. As was previously reported, repetition was found to improve recall, even when no context (picture) was given. In this condition, subjects heard the passage twice as well, but the only difference was that they first heard it without the context, and then with it. One might expect that their

performance should be the best one, because the text was repeated to them and they had the best appropriate context and therefore differ significantly from the control. Although it was found to give the best performance (see Table IV) it did not differ significantly from the control situation. This could be explained by supposing that when subjects heard the passage without looking at the picture they formed a schema that differs from the one which was formed when they heard it with the appropriate context. It might be a 'mismatch' of schemata between one condition and the other, and the effect of enhancing recall with repetition was annulled. These data also support the hypothesis that schemata are formed at encoding.

CHAPTER III

RECALL OF TEXT IN ITS LITERAL AND METAPHORIC SENSE AND RECALL OF PICTURES

I) INTRODUCTION

In the previous experimental chapter, it was found that it was necessary to have the appropriate context (pictures) in order to comprehend and recall the text, supporting the data of Bransford and associates (Bransford and Johnson, 1972; Bransford, 1979). However, when a new condition was introduced, ie having the text simultaneously with the pictures, although performance improved, it did not differ significantly from presenting the pictures before the text.

It was found that a schema was formed at encoding confirming the data of Bransford and Johnson (1972), Dooling and Mullet (1973), Anderson (1978).

In the present chapter, the text chosen was quite different from the first experiment. It was a "real life text with illustrating pictures" from a daily newspaper "with the particularity that it could be interpreted in a metaphoric sense.

Recently, the importance of metaphor has been studied in linguistics, philosophy and psychology (Ortony, 1979; Lakoff and Johnson, 1980). The

interest of Linguistics and Psychology in metaphor has been centered mainly on the comprehension and remembering of idioms, proverbs and isolated sentences (Billow, 1977; Ortony, 1978; Ortony,1979, for reviews), but these studies have not used texts as their experimental material.

The experiment reported in this chapter has four purposes. The first purpose was to examine how subjects recall a text either in its literal or metaphorical sense, without inducing them to remember it in any sense, that is, they were free to comprehend and recall it in its literal or metaphorical sense (Incidental learning task in that sense).

As a consequence of subjects' spontaneously processing the text either literaly or metaphoricaly, the design will treat this factor (Material) as repeated measures. Thus, spontaneous recall of text either in its literal or metaphoric sense could be compared to recall of pictures.

Secondly, the experiment compares the influence played by a metaphoric cue given either at recalling or at retrieval with its absence in relation to the subjects' subsequent recall. It was expected that giving that cue at learning would improve the recall of text in its metaphoric sense. If that was so, the schema would be formed at encoding and not at retrieval.

Thirdly, it is examined how the conditions of pre-

sentation of pictorial or verbal information, either presented one before the other or simultaneously would affect the recall of text in its literal, and metaphoric sense and of pictures. It was expected that encoding either the text in its literal sense or metaphoric sense would improve their subsequent recall with a simultaneous presentation.

In dealing with a metaphoric text the context was manipulated by giving the subjects a metaphoric cue or no cue.

In relation to pictorial information all conditions of presentation were maintained (i.e. Before,Simultaneous and After the text). The Without Context condition in Bransford and Johnson's was not included. Furthermore, some of the pictures contained information which could be relevant for the metaphoric processing whenever the cue was present (for example the names of the cities of Castellon,Valencia and Alicante), an observation which emerged from pilot studies. Because of that, it was decided to provided the subjects in all the conditions with the pictorial information.

And finally, it is examined whether forgetting occurred over time (with a delay) in any of the three materials.

II METHOD

SUBJECTS

The subjects were three hundred and sixty Psychology students who carried out the experiment voluntarily. Their ages ranged from seventeen to thirty-seven years old. Their average age was 24.9. The means were approximately the same in the different groups.

It can be taken for granted that the students, given their socio-cultural background, are informed and aware of the more relevant political events in their own country. They also know perfectly well the political tendencies of the national newspapers.

MATERIALS

There were two tasks: a learning, and a performance task. The materials are described accordingly.

LEARNING TASK

The text was chosen from a very well-known and extreme right-wing daily newspaper published in Madrid called "El Alcazar" (see Table VII), something similar to the weekly "Bulldog" published by the National Front. It was published on the first of March, 1981, page 6, section Opinion. The text was accompanied by four photos related to it. (see Plates 1 and 2). Some photographs were made of the four pictures, size 21 cm x 29.5 cm, and others of the whole page of the newspaper of the same size, including text, pictures,

Table VII

TEXT TRANSLATED INTO ENGLISH

The young rider, Anthony Webber, and his horse, "Anitacat", are out of the race, this is a beginner's event in the renowned British Steeplechase, training ground for the top riders in the world, who then go on to enter in the big events at Derby and Epsom, and the famed Grand National in which our Duke of Alburquerque has participated on so many occasions. For just a moment it seems as though Anthony is on a reel of film which is being run backwards, but no, "Aqui no ha pasado nada", here, nothing has happened. All the same, he is out of the race.

Other mounts less dangerous, although you never can tell, are those of steel. Preparations are under way for the major cycling season. But before "La Vuelta", "Il Giro", and "Le Tour", our chaps will have to be sifted through local events such as the one known as, "Las Tres Provincias", (the three provinces), held in Valencia. The prizes to be won are pictured on the stand.

In Jaca, there is the unexpected scene of ice hockey. Here in Spain we are the unrivalled champions of hockey on idler skates, and holders of the Silver Medal for third, and in fact the true kind, grass hockey. But back to ice, here there is not much that we can say. The picture serves to illustrate our terrific (9-0) beating by the Canadians, who have proved their worth even in the Inter-University winter sports contests.

The lengthy season of indoor athletics can be viewed as warming-up engines prior to the big outdoor season. In New York, in the renowned Madison Square Gardens, Vigneron of France won the pole-vaulting event, with his fellow countryman Houvion as runner-up, they both almost gave the Polish Kozakiewickz, a fright during the Olympic Games held in Moscow.

es deportivas

ıony Webber y su caballo
·dado fuera de carrera, una
ıantes en el acreditado
plechase» británico que tiene
fuente de los mejores jinetes del
eberrimas carreras del Derby
ınd National donde tantas
aestro Duque de
un momento da la impresión
á en la imagen de una película
marcha atrás, aquí no ha
la realidad es que ha quedado

nos peligrosas, aunque eso
e acero, se preparan para las
istas de la temporada. Antes de
y el «Tour» habrá que pasar
arreras como ésta valenciana
es Provincias». Sobre la mesa,

o espectáculo del hockey sobre
mos los amos mundiales, sobre
s la medalla de plata olímpica
, en realidad el auténtico, el de
lo tenemos poca cosa que decir.
ponde a la severa derrota por
anadá, que en esto son gente,
s Universitarios de Invierno.
tletismo «indoor», calienta
n temporada al aire libre. En
amoso Madison Square
Vigneron ha ganado la prueba
, seguido de su compatriota
uvieron a punto de darle un
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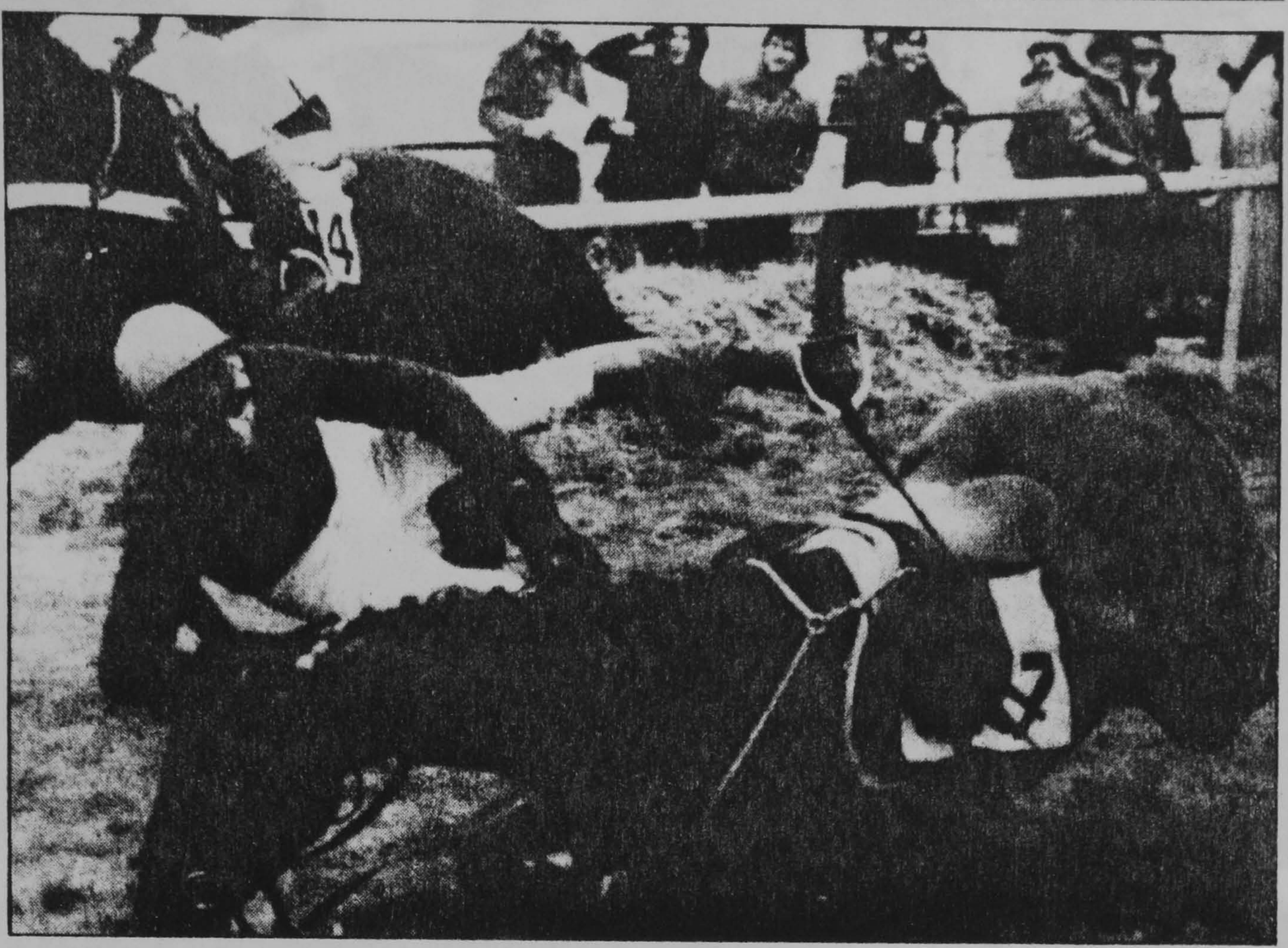
á.



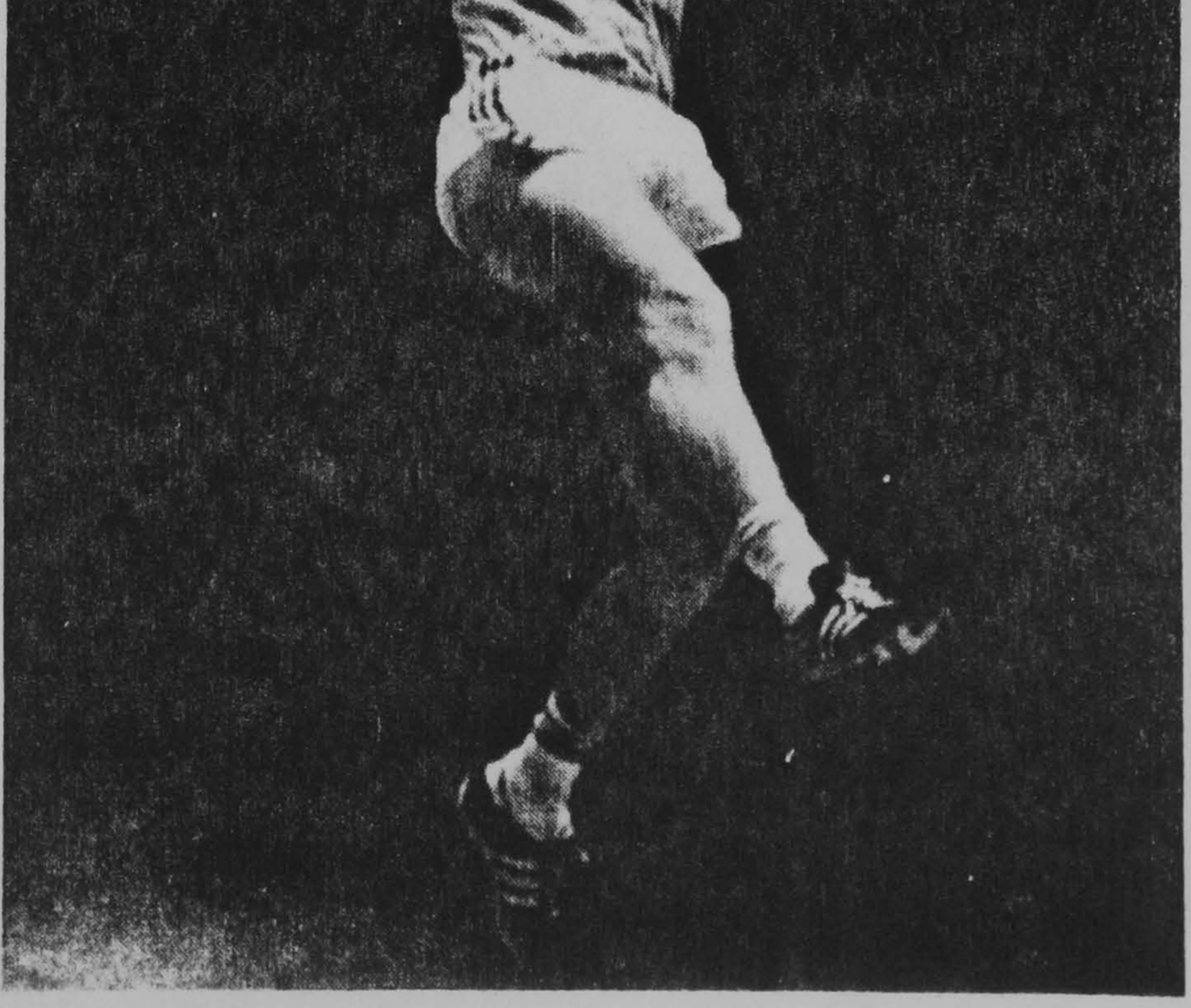
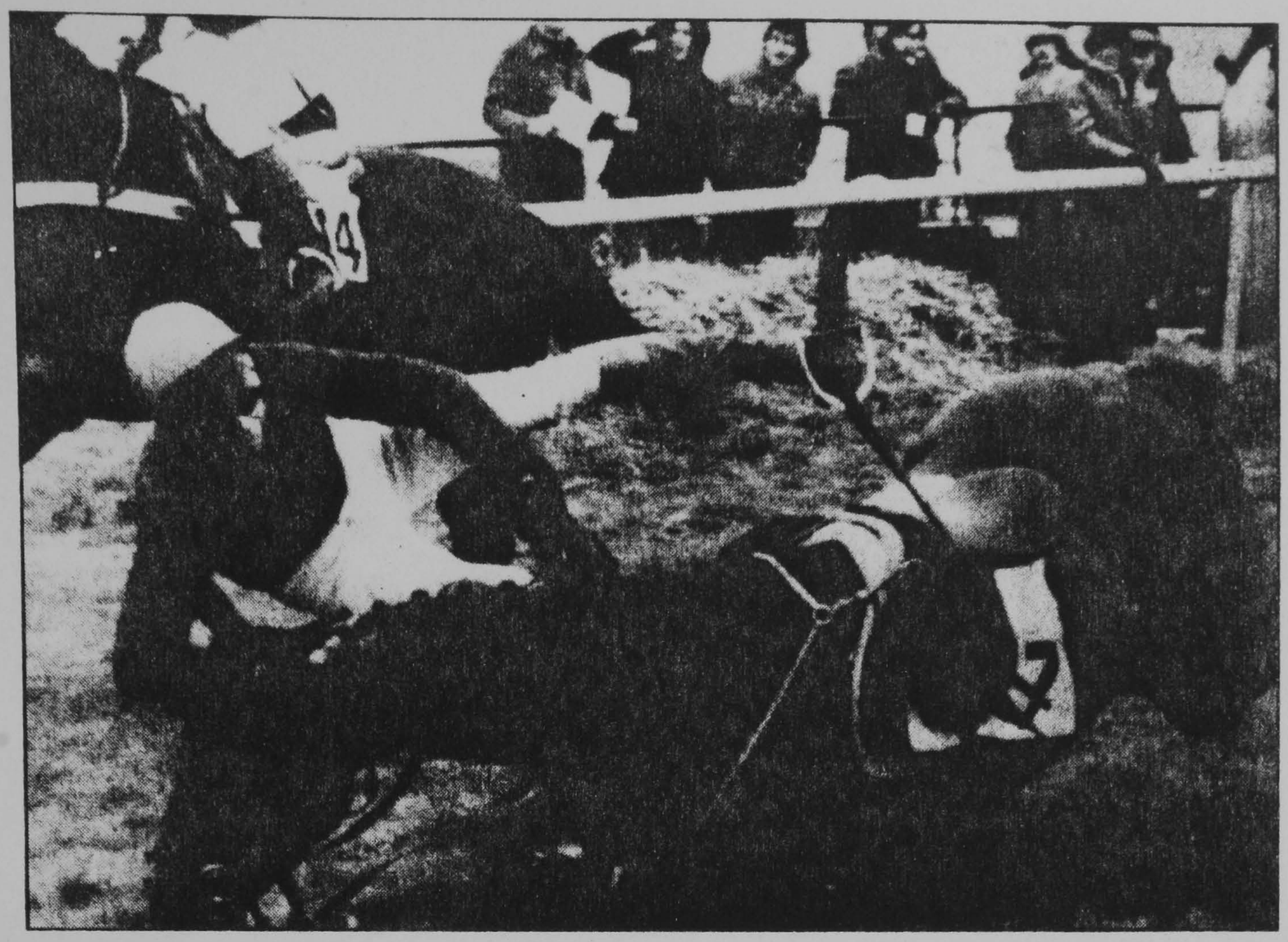
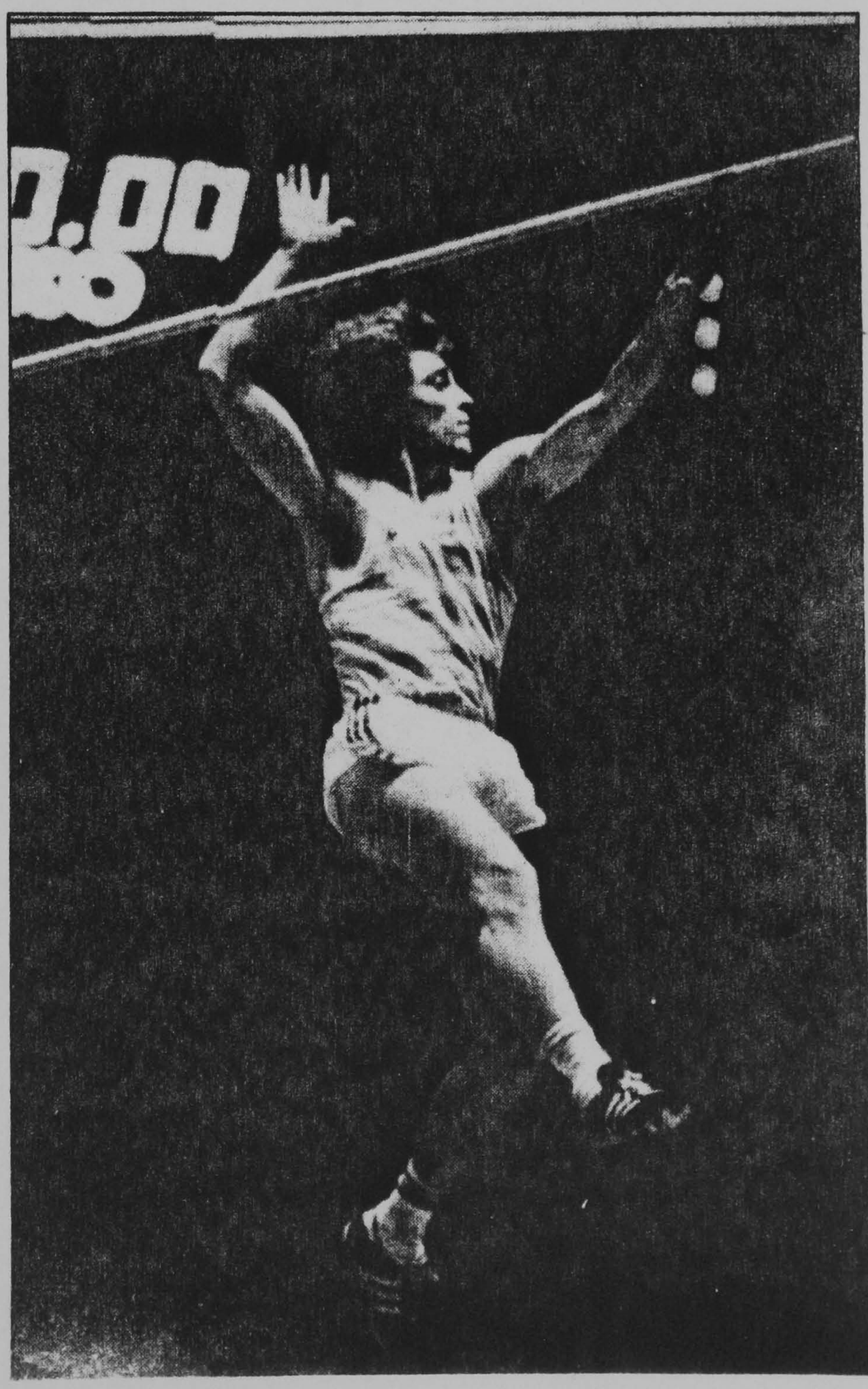
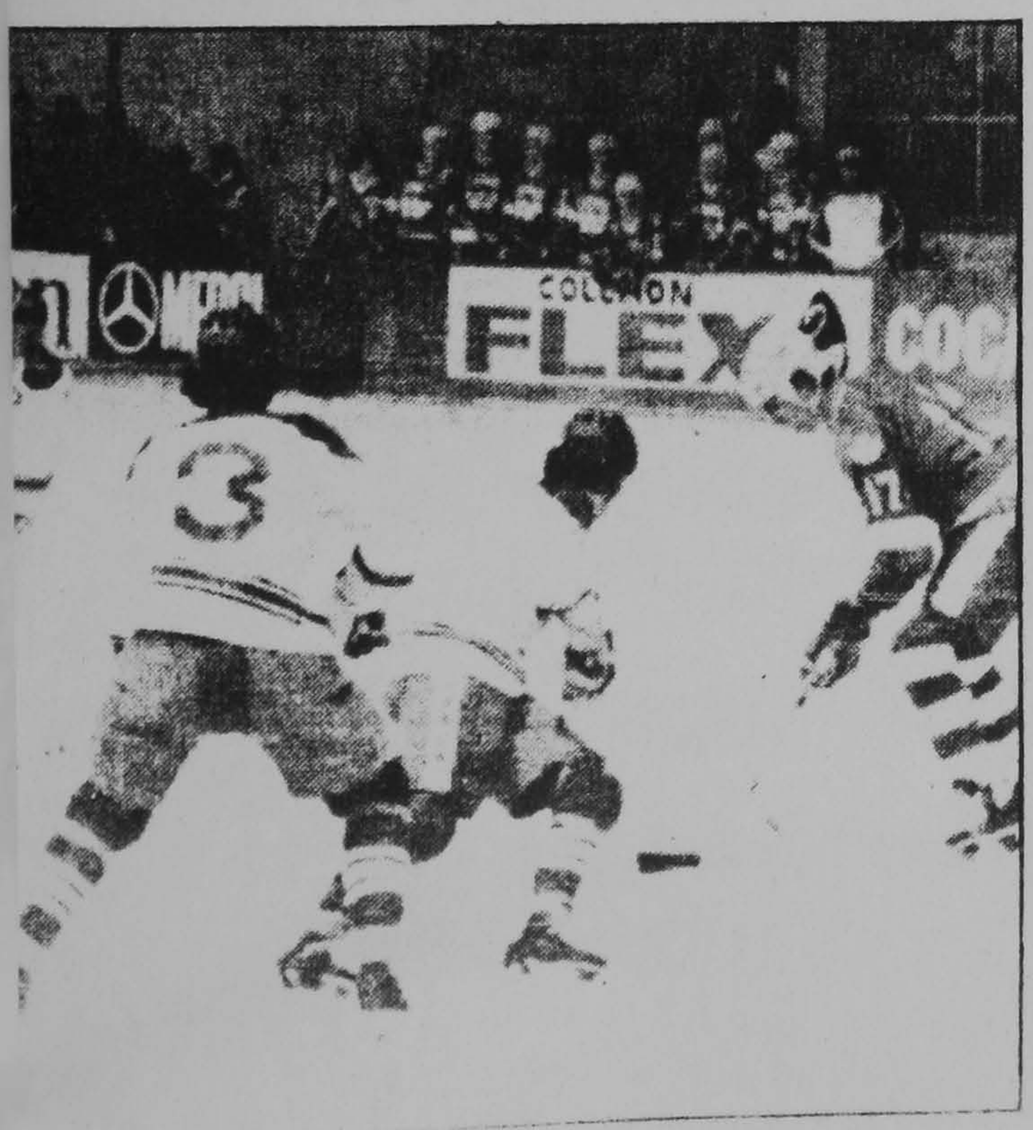


PLATE 2







name of the newspaper, page and section. The text was also typed on a different page for some experimental conditions.

A historical - political background is described in Appendix III in order to give a whole picture of the political situation to understand the text in its metaphoric sense.

The basic metaphoric ideas of the text interpreted by a group of judges, University lecturers, in relation to the four photographs are as follows:

The first paragraph refers to Lieutenant Coronel Antonio Tejero who seized the Parliament and tried to collapse the democratic system in Spain (see Appendix III). The sentence "aqui no ha pasado nada" (here nothing has happened) is exactly the same as the one uttered by Tejero when he entered into the Parliament with his troops. This sentence was heard by all Spanish people through tape-recording and video-tape.

The second paragraph refers to the situation created by the tanks in Valencia (see Appendix III), being a prelude of a national event as "La Vuelta" (a cycling race which takes place all over Spain). The winners will get important prizes.

The third paragraph refers to a description of the armed forces. Hockey on skates refers to armoured forces, grass hockey to Cavalry and Guardia Civil

(whose uniform is green), and ice hockey to the Navy. This paragraph tries to assess and describe their position in the coup (see Appendix III).

The last paragraph refers to the foreign political situation mainly France and Poland (see Appendix III).

So, this text was published in that newspaper a week after the attempted military coup. Although it failed that time, it might be successful next time ("if engines were still warmed up for the big out-door season"). In 23rd of June 1981 (four months later than the text was published) another attempted military coup also failed, showing the relevance of the metaphoric message when it was published on the 1st of March 1981.

PERFORMANCE TASK

The performance task consisted of a recall task. The subjects were simply given three sheets of paper on which to recall the text and pictures.

PROCEDURE

The subjects were divided at random to the different conditions. In all conditions they were asked to write down their sex and age. The experiment was carried out collectively in groups of ten subjects.

It was a 3 x 3 x 3 x 2 factorial design, with the only repeated measure in the first factor. The first factor was Material with three different levels. The first level was Literal, being the sense of the text

in which subjects could remember phrases, sentences, paraphrases of the text in its literal sense. The second level was Metaphorical, being the sense in which the subjects could remember ideas related to the attempted military coup, or political situation in general. The third level was Pictures, in which subjects remembered details of the 4 pictures.

The second factor was Presentation of the material with three different levels. The first level was Simultaneous Presentation, in which the text and the pictures were presented at the same time for four minutes. The second level was Presentation Before, in which the subjects first saw the pictures for one minute, and afterwards they read the text for three minutes. The third level was Presentation After in which they read the text for three minutes, and they then saw the picture for one minute.

Pilot studies have shown that subjects needed four minutes to read this text when it was presented simultaneously with the pictures. On the contrary, subjects only needed three minutes to read it without them. Thus, in order to homogenize the time, it was decided to allow subjects one minute to look at the pictures and three minutes to read the text, so that both tasks would have the same amount of time as Simultaneous presentation.

The third factor was CUE. In the first level, NOCUE, subjects were not given any information about the

newspaper, date, section, etc. The second was PRECUE, in which subjects could see the name of the newspaper, page, section etc: so the cue was given in the learning task. The third level was POSTCUE where subjects did not have that information in learning, but in recall.

The fourth factor was a performance factor: TEST-TIME. In the first level, IMMEDIATE, subjects were tested immediately, and in the second level, DELAYED, they were tested twenty-four hours later. The time given for the performance tasks was constant for all subjects: seven minutes for recalling the text and also seven minutes for recalling details of pictures. There were 20 subjects in each condition (see TABLE VIII for a summary of design).

Instructions:

The general instruction to all conditions was to ask the subjects to look at the pictures and read the text carefully, and try to understand both, because they would have a memory test on both materials. The specific instructions given in the different conditions were as follows:

1.1) Simultaneous conditions:

"You are going to see some sports pictures accompanied by a text. Read the text and look at the pictures carefully because afterwards you will have a memory test on both materials".

with repeted measures on the first factor).

LITERAL METAPHORIC PICTURES	SIMULTANEOUS PRESENTATION	NOCUE	IMMEDIATE	
			DELAYED	
		PRECUE	IMMEDIATE	
			DELAYED	
		POSTCUE	IMMEDIATE	
			DELAYED	
LITERAL METAPHORIC PICTURES	PRESENTATION BEFORE	NOCUE	IMMEDIATE	
			DELAYED	
		PRECUE	IMMEDIATE	
			DELAYED	
		POSTCUE	IMMEDIATE	
			DELAYED	
LITERAL METAPHORIC PICTURES	PRESENTATION AFTER	NOCUE	IMMEDIATE	
			DELAYED	
		PRECUE	IMMEDIATE	
			DELAYED	
		POSTCUE	IMMEDIATE	
			DELAYED	

twenty subjects in each condition with a total of 360 subjects in recall, and 360 different subjects in recognition.

1.2) Before conditions:

"You are going to see first some sports pictures, look at them carefully, because afterwards you will have a memory test on them. Then you will be given a text, read it carefully, because afterwards you will have a memory test on it".

1.3) After conditions:

"You are going to be given first a text, read it carefully because afterwards you will have a memory test on it. Then you are going to see some sports pictures, look at them carefully, because afterwards you will have a memory test on them".

2.1) Nocue conditions:

Nothing was said about the source of the text or pictures.

2.2) Precue conditions:

The subjects were told: "The text and pictures you are going to see were published in "El Alcazar", on the 1st of March 1981, page 6, Section Opinion. Remember that the attempted military coup took place on the last 23rd of February and this text and these pictures were published six days after".

2.3) Postcue conditions:

Nothing was said about the source of the text and pictures when presenting them to the subjects. At recall, they were told: "The text and pictures you have seen came from "El Alcazar", published on the 1st of March 1981, page 6, Section Opinion. Remember that the

attempted military coup took place on the last 23rd of February and this text and pictures were published six days after."

3.1) Immediate conditions:

Just after having seen the material, subjects (who had been given two sheets of paper) were told: "Recall the text as accurately as you can. In the first page write down as many ideas about it as you can remember. Then recall the pictures as accurately as you can and write down details of them on the second sheet of paper". After finishing these two tasks, they were told: "Please, write down briefly in the third sheet of paper, any metaphoric meaning that you think you have found in both text and pictures".

3.2) Delayed conditions:

After having seen the material, subjects were told: "Tomorrow we will do the second part of the experiment. Please do not comment to anybody about what you have seen or read." At the moment of recall they were told: "Please write down Yes or No, whether you have commented about the text and pictures you saw yesterday. Now recall the text you read yesterday as accurately as you can. In the first page write down as many ideas about as you can remember. Then recall the pictures you saw yesterday as accurately as you can and write down details of them in the second sheet of paper." After finishing both recall tasks, they were told: "Please, write down briefly in the third sheet of paper any metaphoric meaning that you think you have found in both text and pictures".

As can be seen from the instructions when the subjects were asked in the first place just to recall the text, they were not induced at all to write down ideas either in the literal or metaphoric sense. One important aspect of the experiment was to see whether metaphoric meaning was spontaneously understood by the subjects. On the other hand, the purpose of the final part of the performance task was to check whether subjects could find a metaphoric sense when they were explicitly instructed to do so.

Pilot studies have shown that subjects had a good performance recall both in literal and metaphoric sense, when they were asked to write down briefly any metaphoric meaning they had found in either verbal or pictorial material, after the learning task finished and before the recall task started. As if the enquiry of the metaphoric meaning was acting as a prompt.

It was also found that when recall of pictures was asked to perform before recalling verbal material, it improved subjects' recall of verbal materials. So, it was decided that the order of recall was going to be the same for all subjects in all conditions, ie first verbal, then pictorial material, and finally asking about the metaphoric meaning.

III) RESULTS AND DISCUSSION

The results are divided into two main blocks.

First of all, the differences are examined between subjects for the text to-be-remembered in the literal sense (LT), the metaphoric sense (MT), and for the pictures (P).

Secondly, the materials are analysed within-materials (LT, MT, and P), that is, the performance of subjects in each task according to the conditions.

In order to facilitate the reader's task, after each section of results, there will be a short discussion. A general discussion is also given at the end of the chapter.

III.A) BETWEEN SUBJECTS.

Under this heading, recall of the three different materials were described between subjects.

III.A.I.) RECALL OF TEXT IN ITS LITERAL SENSE.(LT)

The criteria for recalling LT were set up a priori by three judges. The text was divided into four paragraphs. Literal words or sentences of the original text, and paraphrases were accepted as correct (see Appendix II).

The maximum score was 28 points. Two judges scored the text recalled. Interjudge 's reliability (Pearson correlation was .99 ($p < 0.001$). When the judgements were not the same, a third judge was introduced, and his score was valid for subsequent analysis.

Proportions of recall according to the different conditions were computed. Mean proportions of ideas recalled are shown in Table IX for the different conditions, and plotted in Figure VI. Inspection of this Figure reveals an interaction between Testtime and Cue, disregarding Presentation. The slope of the cu rve of Nocue is steeper than Precue in all of the Presentations. Performance in Precue deteriorates over time, except in Before Presentation. Recall in Postcue improves in general over time.

Proportions of recall were transformed by arc sine in degrees to carry out an analysis of variance(Table X). The main factors were significant. (Testtime , $F(1,342) = 5.305$, $p < 0.05$; Cue, $F(2,342) = 7.877$, $p < 0.001$; and Presentation, $F(2,342) = 21.566$, $p < 0.001$).

TABLE IX

RECALL OF TEXT IN ITS LITERAL SENSE (LT)

MEAN PROPORTIONS OF IDEAS ACCORDING TO CONDITIONS

PRESENTATION	CUE	TEST	$\bar{X}$
SIMULTANEOUS	NOCUE	IMMEDIATE	0.43
	NOCUE	DELAYED	0.37
	PRECUE	IMMEDIATE	0.38
	PRECUE	DELAYED	0.28
	POSTCUE	IMMEDIATE	0.34
	POSTCUE	DELAYED	0.41
BEFORE	NOCUE	IMMEDIATE	0.39
	NOCUE	DELAYED	0.28
	PRECUE	IMMEDIATE	0.26
	PRECUE	DELAYED	0.26
	POSTCUE	IMMEDIATE	0.30
	POSTCUE	DELAYED	0.28
AFTER	NOCUE	IMMEDIATE	0.30
	NOCUE	DELAYED	0.26
	PRECUE	IMMEDIATE	0.24
	PRECUE	DELAYED	0.22
	POSTCUE	IMMEDIATE	0.29
	POSTCUE	DELAYED	0.31

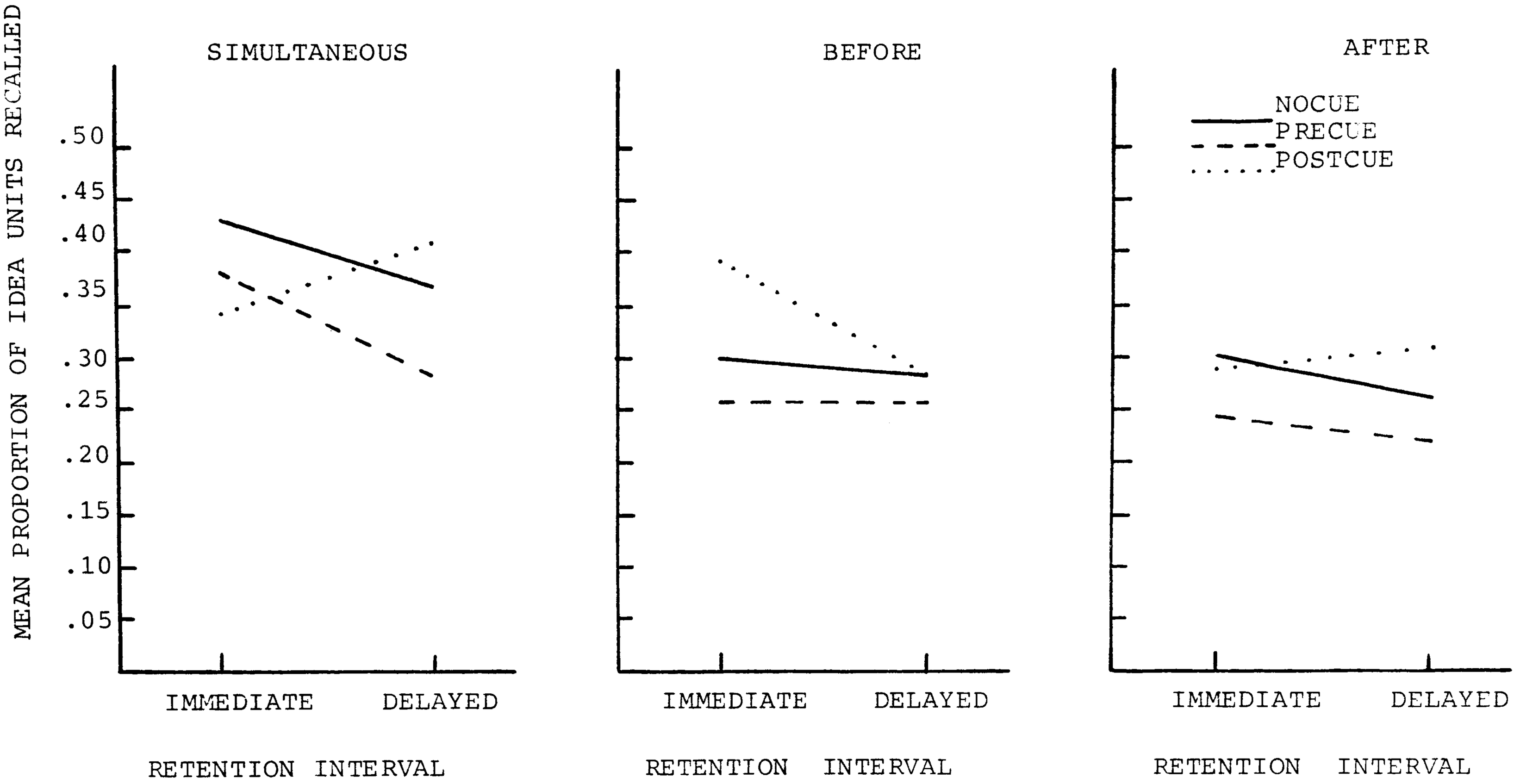


FIGURE VI

MEAN PROPORTIONS OF IDEAS RECALLED IN ITS LITERAL SENSE

ANALYSIS OF VARIANCE FOR RECALL OF TEXT IN ITS LITERAL SENSE. (LT)

SOURCE OF VARIATION	SS	DF	MS	F
TESTTIME	367.84	1	367.84	5.305*
CUE	1092.44	2	546.22	7.877***
PRESENTATION	2988.15	2	1494.07	21.546***
TESTTIME.CUE	681.98	2	340.99	4.917**
TESTTIME.PRESENTN	62.31	2	31.16	0.449
CUE.PRESENTN	246.31	4	61.58	0.888
TESTIME.CUE.PRESENTN.	326.05	4	81.51	1.175
RESIDUAL	23715.14	342	69.34	
TOTAL	29480.21	359	82.12	

* p<0.05
** p<0.01
*** p<0.001

The only significant interaction, as we expected was Testtime. and Cue (see also Figures VI and VII). Inspection of both figures shows that it seems that forgetting occurs in Nocue and Precue conditions but not in Postcue.

Further analyses (Keppel,1973) were carried out to determine the simple main effects of this interaction (Table XI), because one cannot say much about the two main factors implied in this interaction. Looking at Table XI, Testtime at Nocue ($F(1,342) = 9.91$, $p < 0.01$) and Testtime at Precue ($F(1,342) = 3.91$, $p < 0.05$) were significant. Variations in recall due to Testtime were then in Nocue and Precue. But Testtime in Postcue was not significant So,there was no variations in recall due to Testtime in Postcue (see also Figures VI and VII).

A Newman - Keuls test (Keppel ,1973) was carried out on each level of Testtime factor, (Immediate - Delayed) to look at the differences in the levels of the Cue factor(Nocue,Precue and Postcue). In Immediate conditions(see also Figure VII),Nocue was significantly better than Precue and Postcue,but Postcue was not significantly greater than Precue (Table XII). In Delayed conditions, Postcue was significantly higher than Nocue , and the latter was not significantly better than Prcevue (Table XIII) .

Because Presentation did not enter into any interaction with either or both factors, Testtime and Cue (Table X), a Newman - Keuls test was done to look at the differences of this main factor (Simultaneous, Before and After).

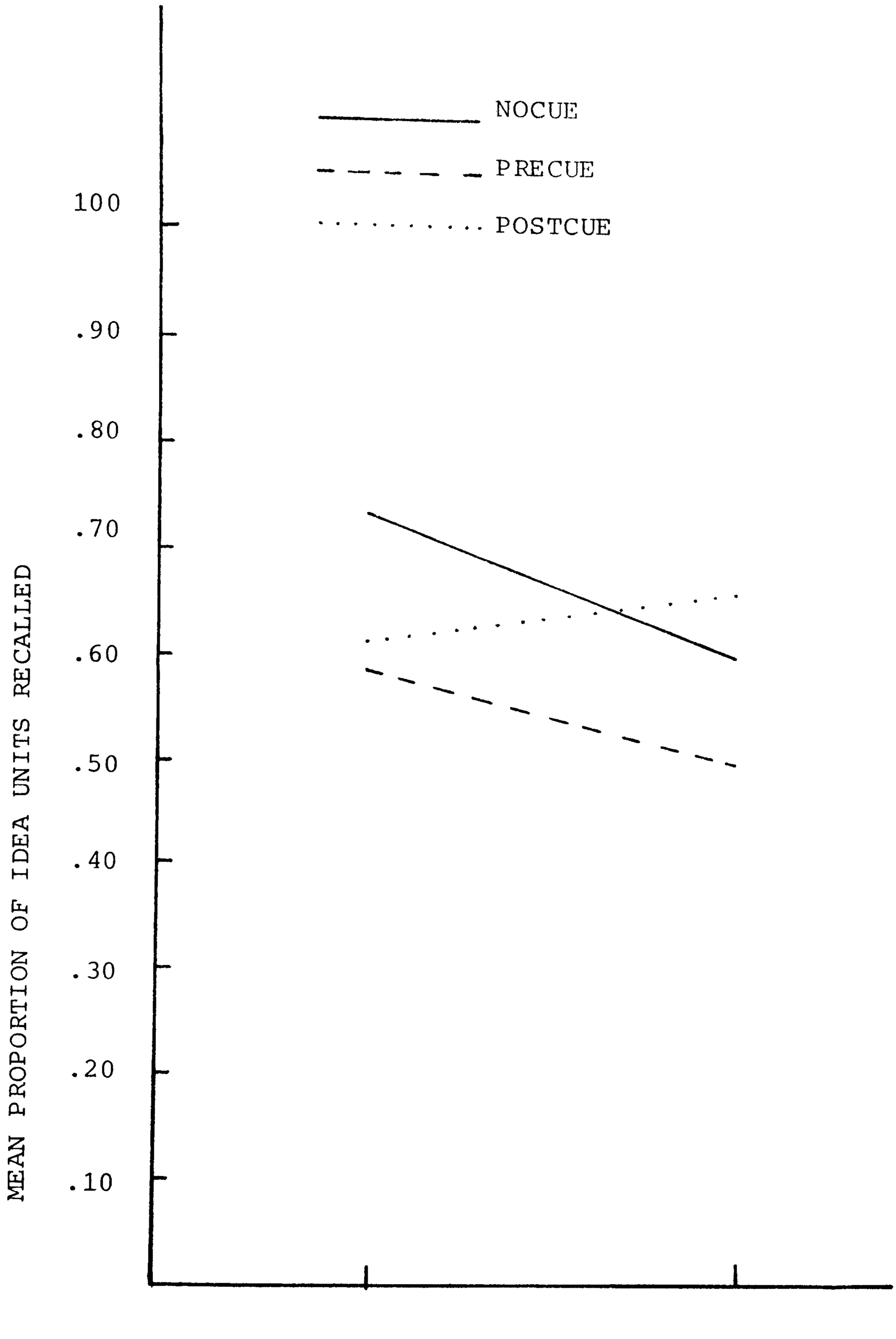


FIGURE VII

MEAN PROPORTIONS OF IDEAS RECALLED OF TEXT IN ITS LITERAL SENSE, SHOWING THE TESTTIME AND CUE INTERACTION.

Analysis of variance to determine the simple main effects of factor Testime at different levels of cue Factor in recall of text in its literal sense (LT)

Source of variation	SS	df	MS	F
SS Testtime at Nocue	687.36	1	687.36	9.91**
SS Testtime at Precue	271.20	1	271.20	3.91*
SS Testtime at Postcue	89.78	1	89.78	1.29
Residual		342	69.34	

* $p < 0.05$

** $p < 0.01$

Newman-Keuls Test on Recall of text in its' literal sense (LT) - looking at the differences among levels of the Cue Factor (No Cue, Precue, and Postcue) on Immediate Conditions.

	Precue	Postcue	Nocue		
Cue:	1947.20	1982.20	2249.20	r	CRN-K
Precue=1947.20	---	35.60	302*	3	213.50
Postcue=1982.80		---	266.40*	2	178.67
NoCue=2249.20					

*p<0.05

Newman-Keul's Test on Recall of text, recall in the literal sense (LT), to look at the differences among levels of the Cue Factor (NoCue, Precue, and Postcue) on Delayed conditions.

	Precue	Nocue	Postcue		
Cue:	1766.80	1962.00	2086.60	r	CRN-K
Precue=1766.80	---	195.20	319.80*	3	213.50
NoCue=1962.00		---	124.60	2	178.67
Postcue=2086.60			---	-	---

* $p < 0.05$

Simultaneous Presentation conditions were significantly better than Before and After Presentations. But Before was not significantly higher than Presentation After (Table XIV).

TABLE XIV

Newman-Keul's Test on Recall of Text in its literal sense to look at the differences amongst levels of Factor Presentation (Simultaneous, Before & After).

	After	Before	Simultaneous		
Presentation:	3668.40	3850.80	4476.00	r	CRN-K
After=3668.40	---	182.40	807.60*	3	301.94
Before=3850.80		---	625.20*	2	252.68
Simultaneous=4476.00			---		

* $p < 0.05$

DISCUSSION

Looking at Immediate conditions, subject had a "mismatch" of information between the cue, if taken as metaphoric, and the text either at Precue, (given the cue before reading the text), or at Postcue (given the cue after reading the text). But at Nocue, they encoded the text without any interference.

These results support the data of performance's deterioration when a shift of perspective in a text is introduced (Pichert and Anderson, 1977; Anderson and Pichert, 1978; Flammer and Tauber, 1981; Fass and Schumacher, 1981;) or when titles that do not correspond to the text are introduced (Dooling and Lachman, 1971; Bransford and Johnson, 1972; Dooling and Mullet, 1973; Barclay et al., 1974; Britton, 1980).

In Delayed conditions, the two equivalent conditions are Nocue and Postcue, because they remained the same during the retention interval, without the cue. The latter differed significantly from Precue.

Subjects in Postcue seem to have already processed the material so that a metaphoric cue given at recall did not alter their performance. It might be that they interpreted the cue as a literal one and retrieval was facilitated (Anderson and Bower, 1973; Rubin, 1977) and improved their performance over Precue conditions. However, if the cue was interpreted as a literal one, the superiority of performance should be shown over Nocue as well. Although that is the case, the difference was not statistically significant.

Forgetting occurred over time either when Nocue

was given, or when it was given in the learning task (Precue). It is important to point out that some subjects in the Precue Immediate conditions reported after the experiment was finished that they interpreted the cue as an experimental device, "to induce", forgetting. This being the case, it might explain specific strategies to encode the text in its literal sense.

When the cue was given at recall (Postcue) subjects did not show any forgetting. The slope of Postcue conditions is the consequence of a depression at Immediate rather than an increase in the recall rate at Delayed. It should be pointed out that subjects in each condition were different. There were not significant differences between Nocue and Postcue at Delayed, that is, there was not an increase in recall in Postcue conditions, in relation to Immediate. However, there were significant differences between Nocue and Postcue in Immediate conditions.

The fact that there is a mismatch of information between the text and the cue in Precue conditions, might be interpreted as indicating that a schema is formed at encoding, supporting the constructive approach.

The optimum way of presenting the material seems to be Simultaneous, i.e. text and pictures at the same time. It did not make any difference whether you presented the pictures before or after the text to recall the text in its literal sense. The pictures serve as the, "appropriate context", to accompany the text (Bransford and Johnson, 1972; Bransford, 1979) but only when they were presented simultaneously with the text. This result contradicts

Bransford and Johnson's results and the ones reported in the last chapter. It might be the case that for difficult tasks the context must be present in order to form the appropriate schema.

III.A.II.) RECALL OF TEXT IN ITS METAPHORIC SENSE (MT).

The criteria for recalling the text in its metaphoric sense (MT) were also set up a priori by the same judges as in recall of LT. The text was also divided into four paragraphs. Metaphoric ideas and paraphrases were allowed. It was also computed as metaphoric ideas anything related to the political situation (i.e. attempted military coup) evoked in the text when the subject: were asked to write down the metaphoric sense that they thought was in it. The only constraint was that these ideas were new and not already scored in the "spontaneous" recall protocol. Proportions of ideas produced spontaneously as metaphoric were about 80% while those produced when metaphoric sense was subsequently requested were about 20% .

Maximum score was 20 idea units (see Appendix IV). Two judges also score the ideas. Interjudge's reliability (Pearson correlation) was .94 ($p < 0.001$). When the judges did not agree a third judge was introduced and his score was valid for those subjects.

Proportions of ideas recalled according to the different conditions were computed. Mean proportions are shown in Table XV. Recall for Nocue conditions in any Presentation was zero.

The results are plotted in Figure VIII. Inspection of this figure shows that, in the Simultaneous Presentation (when the text and picture were given at the same time) performance in Nocue conditions was zero over time, and

TABLE XV

MEAN PROPORTIONS OF IDEAS RECALLED OF TEXT IN ITS METAPHORIC SENSE ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	$\bar{X}$
	NOCUE	IMMEDIATE	0
	NOCUE	DELAYED	0
SIMULTANEOUS	PRECUE	IMMEDIATE	0.07
	PRECUE	DELAYED	0.26
	POSTCUE	IMMEDIATE	0.24
	POSTCUE	DELAYED	0.12
	NOCUE	IMMEDIATE	0
	NOCUE	DELAYED	0
BEFORE	PRECUE	IMMEDIATE	0.15
	PRECUE	DELAYED	0.17
	POSTCUE	IMMEDIATE	0.07
	POSTCUE	DELAYED	0.03
	NOCUE	IMMEDIATE	0
	NOCUE	DELAYED	0
AFTER	PRECUE	IMMEDIATE	0.03
	PRECUE	DELAYED	0.09
	POSTCUE	IMMEDIATE	0.007
	POSTCUE	DELAYED	0.02

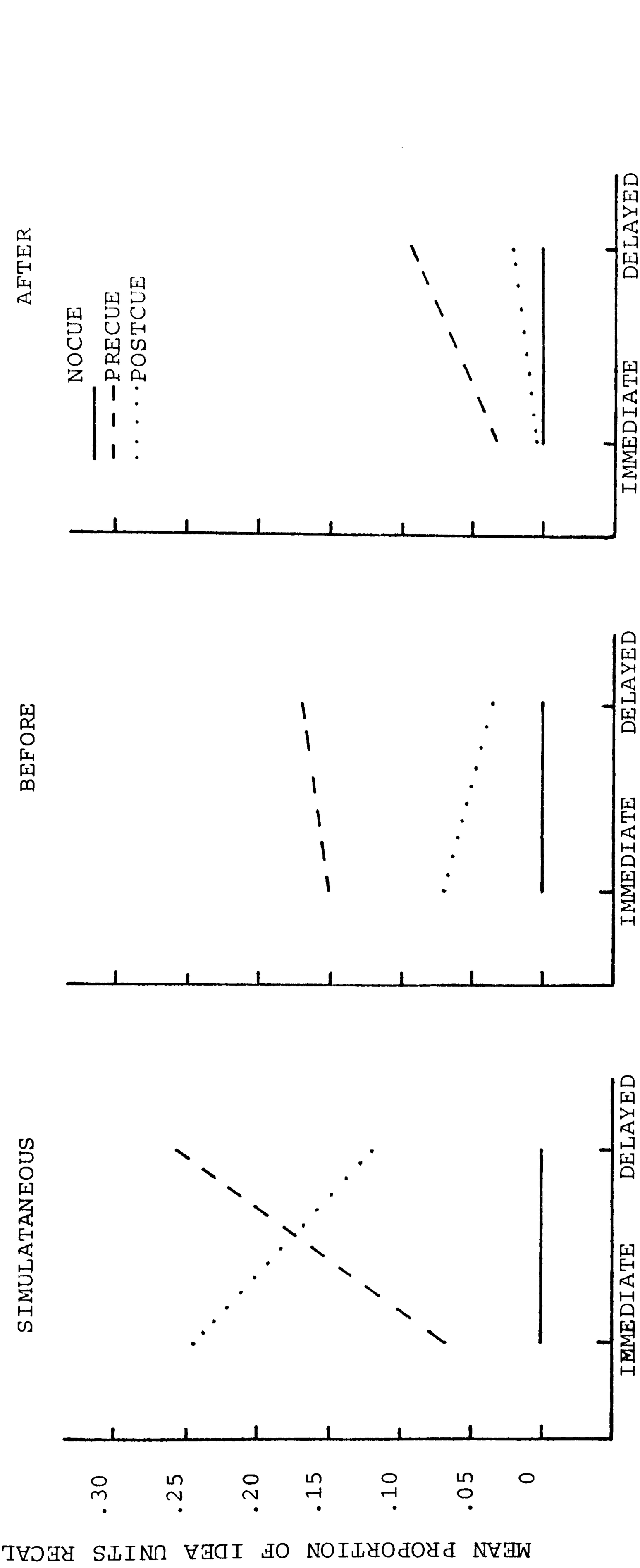


FIGURE VIII

MEAN PROPORTIONS OF IDEAS RECALLED OF TEXT IN ITS METAPHORIC SENSE

Precue seemed to help recall over time, and Postcue just the opposite. Secondly, in Presentation Before, recall was also zero in Nocue condition. Precue condition seems not to make any difference, while Postcue condition deteriorated recall over time. Finally, in Presentation After (pictures presented after the text), recall for Nocue condition was also zero, it improved over time for Precue condition and it did not show any difference for Postcue condition.

In short, there appears to be a higher-order interaction (Testtime x Cue x Presentation) and there might be other simple interactions (Testtime x Cue; and Cue x Presentation).

So, an analysis of variance (see Table XVI) was carried out on the data (proportions were transformed by arc sine in degrees). One can see that the two main factors were highly significant: Cue ($F(2,342) = 29.374$, $p < 0.001$); and Presentation ($F(2, 342) = 11.957$, $p < 0.001$); and the third factor was not significant,Testtime ($F(1, 342) = 0.617$, $p > 0.05$).

TABLE XVI

ANALYSIS OF VARIANCE FOR RECALL OF TEXT IN ITS METAPHORIC SENSE.

	SS	DF	MS	F
TESTTIME.	110.0	1	110.0	0.617
CUE.	10476.7	2	5238.3	29.374***
PRESENTATION	4264.8	2	2132.4	11.957***
TESTTIME.CUE	2328.8	2	1164.4	6.529***
TESTTIME.PRESENTN.	118.1	2	59.1	0.331
CUE.PRESENTN.	3010.7	4	752.7	4.221**
TESTTIME.CUE.PRESENTN.	1811.7	4	452.9	2.540*
RESIDUAL	60989.8	342	178.3	
TOTAL	83110.6	359	231.5	

* $p<0.05$
** $p<0.01$
*** $p<0.001$

The higher-order interaction (Test-time x Cue x Presentation, $F(4,342) = 2.54$, $p < 0.05$) was also significant, and so was the Test-time x Cue ($F(2,342) = 6.529$ $p < 0.001$ interaction and Cue x Presentation ($F(4,342) = 4.221$, $p < 0.01$ interaction (Figure IX and X).

Although there were two significant simple interactions (Test-time x Cue; and Cue x Presentation), it is necessary to assess the levels of the higher-order interaction to give a meaningful interpretation of them. So, additional analyses were carried out to isolate the simple interaction effects.

First of all, one can look at the Cue x Presentation significant Interaction at each level of Test-time (Table XVII). It was found that this interaction was only significant at Immediate ($F(3,342) = 5.07$, $p < 0.001$) and we plotted it (Figure IX). Simultaneous Presentation improves recall according to when you give the cue, reaching a maximum improvement at Postcue. In Presentation Before recall seems to be better in Precue than Postcue conditions, and Presentation After cue seems not to help recall.

It would be interesting to look at the differences amongst the levels of Presentation (Simultaneous, Before and After) in two of the cue levels, that is Precue and Postcue levels because Nocue is zero (see Figure IX) at Immediate.

A Newman-Keuls Test was carried out to look at these differences. (Tables XVIII and XIX). In Precue Imme-

TABLE XVII

Recall of text in its metaphoric sense. Analysis to isolate simple main inter action effects in the higher-order inter action (Testtime x Cue x Presentation).

Source of variation	SS	df	MS	F
Cue x Presentation at Immediate	3615.68	4	903.92	5.07***
Cue x Presentation at Delayed	1202.98	4	300.75	1.69
Residual		342	178.3	

***$p < 0.001$

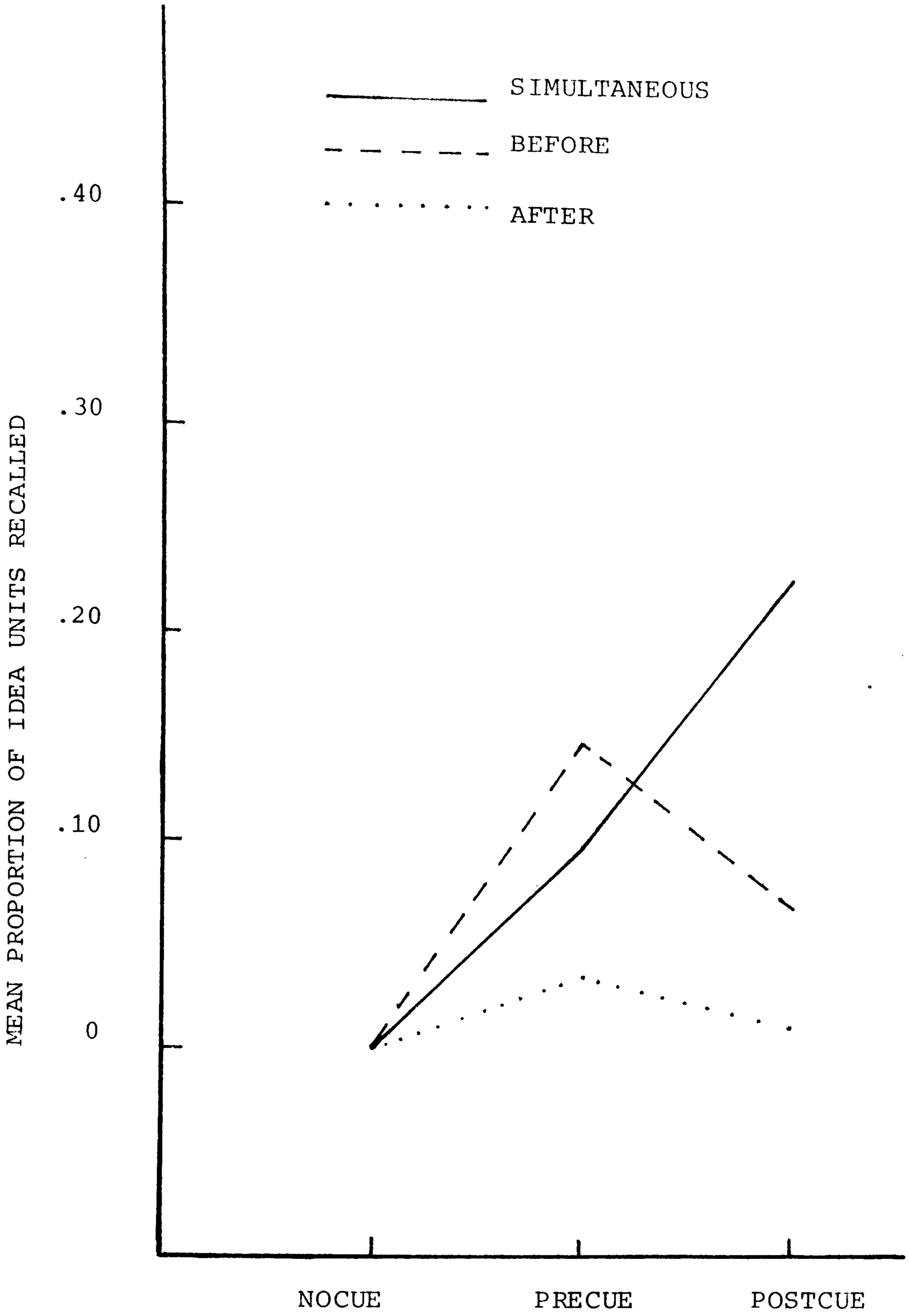


FIGURE IX

MEAN PROPORTIONS OF IDEAS RECALLED OF TEXT IN ITS METAPHORIC SENSE, SHOWING THE CUE AND PRESENTATION INTERACTION AT IMMEDIATE.

TABLE XVIII

Newman-Keul's Test on Recall of text inits Metaphoric sense in Immediate Precue to see the difference of levels of factor Presentation.

	After	Simultaneous	Before		
Presentation	76	188.40	288.20	r	CRN-K
After=76	-	112.40	212.20*	3	197.67
Sim.=188.40			99.80	2	165.42
Before=288.20			-		

*p<0.05

TABLE XIX

Newman-Keul's Test on Recall of text in its Metaphoric sense in Immediate Postcue to see the differences of level of factor Presentation.

	After	Before	Simultaneous		
Presentation	22.80	136.20	453.20	r	CRN-K
After=22.80	-	113.40	430.40*	3	197.67
Before=136.20		-	317*	2	165.42
Simultaneous=453.20			-	-	

*p < 0.05

diate, Presentation Before was significantly better than After, but not higher than Simultaneous (Table XVIII). At Postcue Immediate, Simultaneous was significantly better than Before and After, but Before was not significantly larger than After (Table XIX).

Secondly, Test-time x Cue significant interaction (see Table XVI) was analysed at each level of Presentation (Simultaneous, Before and After). Table XX showed that the only significant simple Test-time x Cue interaction was at the level of Simultaneous ($F(4.342) = 5.37$, $p < 0.001$) and was plotted (Figure X). Variations are due to these two factors only at Simultaneous Presentation. Inspection of this Figure X showed that Precue deteriorates immediate recall, but improved it after a delay (Delayed). Postcue improved recall at Immediate and was deteriorated in Delayed, when both text and pictures are presented at the same time.

Finally, further analyses were carried out to determine the simple main effects, that is, the variations due to a main factor at each of the levels of the other two. One can see that Test-time (Table XXI) at each of the levels of cue, (Nocue, Precue and Postcue) and Presentation (Simultaneous, Before and After) only showed significant results at Precue Simultaneous ($F(1,342) = 13.67$, $p < 0.001$) and at Postcue Simultaneous, ($F(1,342) = 8.05$, $p < 0.01$). So, variations due to Test-time, (see also Figure VIII) are at Precue Simultaneous,

TABLE XX

Recall of text in its metaphysicsense Analysis to isolate simple interaction effects of the higher-order interaction (Testtime x Cue x Presentation).

Source of variation	SS	df	MS	F
SS Testtime x Cue at Simultaneous	3828.01	4	957.00	5.37***
SS Testtime x Cue at Before	109.41	4	27.35	0.15
SS Testtime x Cue at After	200.74	4	50.19	0.28
Residual		342	178.3	

*** $p < 0.001$

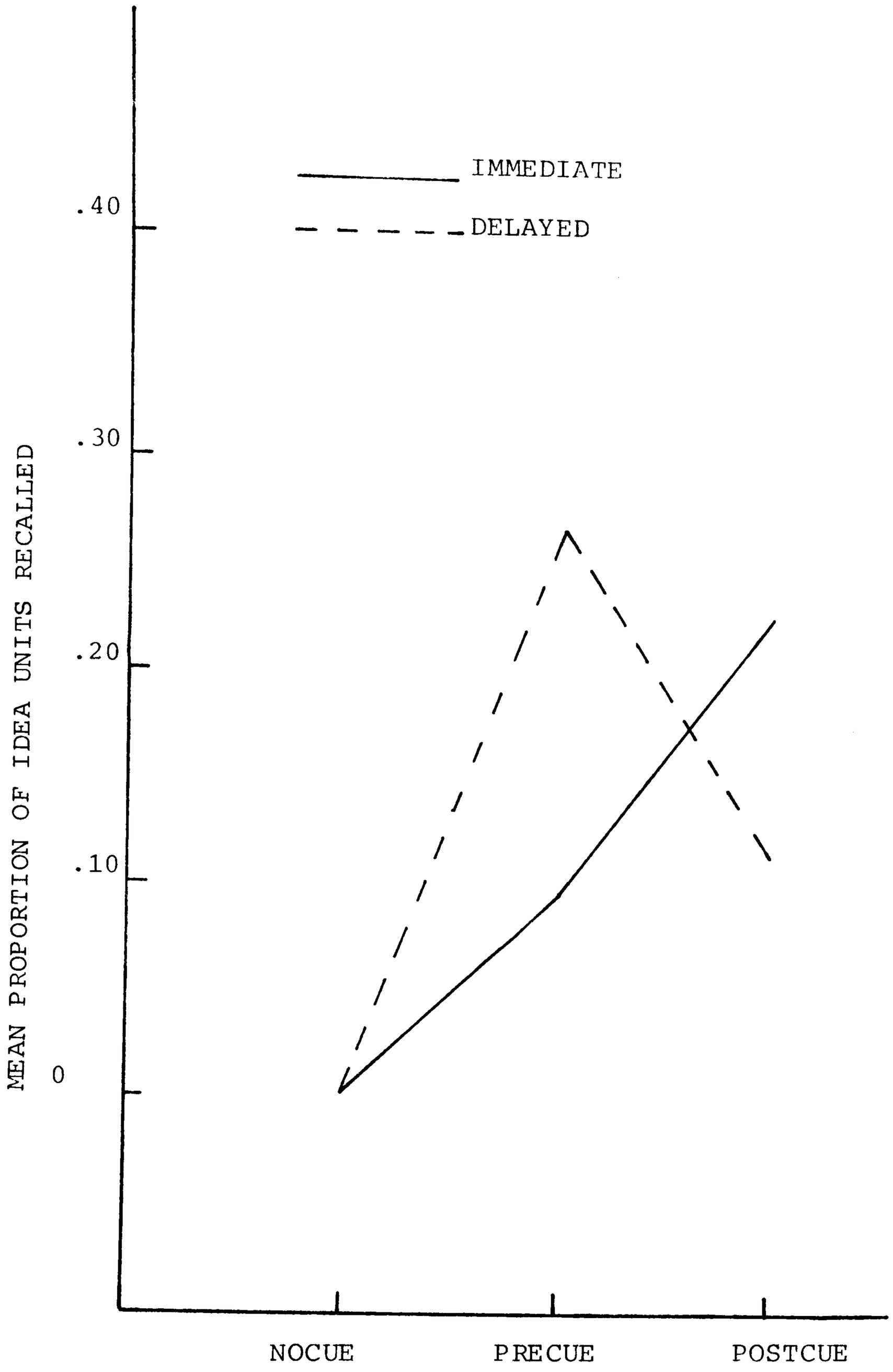


FIGURE X

MEAN PROPORTIONS OF IDEAS RECALLED OF TEXT IN ITS METAPHORIC SENSE, SHOWING THE TEST - TIME X CUE SIGNIFICANT INTERACTION AT SIMULTANEOUS PRESENTATION.

TABLE XXI

Recall of text in its metaphoric sense. Analysis to isolate simple effects of the higher order interaction.

Source of variation	SS	df	MS	F
Testtime at NoCue Simultaneous	0	1	0	0
Testtime at Precue Simultaneous	2436.73	1	2436.73	13.67***
Testtime at Postcue Simultaneous	1435.20	1	1435.20	8.05**
Testtime at NoCue Before	0	1	0	0
Testtime at Precue Before	32.40	1	32.40	0.18
Testtime at Postcue Before	80.66	1	80.66	0.45
Testtime at NoCue After	0	1	0	0
Testtime at PreCue After	363.61	1	363.61	2.04
Testtime at Postcue After	17.69	1	17.69	0.10
Residual		342	178.3	

**p<0.01

***p<0.001

(improvement of recall), and at Postcue Simultaneous (decrement of recall).

Presentation (Table XXII) varied at Precue Immediate ($F(2,342) = 3.16$, $p < 0.05$), and at Postcue Immediate ($F(2,342) = 13.95$, $p < 0.001$), and at Precue Delayed ($F(2,342) = 6.53$ $p < 0.01$). At Immediate there was an improvement of recall with Precue in Simultaneous and Before (see also Figure IX), but although Simultaneous reached its maximum performance at Postcue, Before Presentation deteriorates a great deal.

Cue (Table XXIII) varies at Simultaneous Immediate ($F(2,342) = 5.83$, $p < 0.01$, at Before Immediate ($F(2,342) = 5.83$, $p < 0.01$); at Simultaneous Delayed ($F(2,342) = 17.69$, $p < 0.001$; and at Before Delayed ($I(2,342) = 8.01$, $p < 0.001$). As expected, cue improved clearly at Presentation Simultaneous (see also Figure IX) Immediate. But cue at Before Immediate made an improvement at Precue, and fell again at Postcue. In Delayed conditions, Precue and Postcue had the same patterns at Presentation Simultaneous and Before.

TABLE XXII

Recall of text in its metaphoric sense. Analysis to isolate simple main effects in the higher order interaction. (Testtime x Cue x Presentation).

Source of variation	SS	df	MS	F
Presentation at NoCue Immediate	0	2	0	0
Presentation at Precue Immediate	1127.04	2	563.52	3.16 *
Presentation at Postcue Immediate	4976.54	2	2488.27	13.95***
Presentation at NoCue Delayed	0	2	0	0
Presentation at Precue Delayed	2330.17	2	1165.09	6.53**
Presentation at Postcue Delayed	764.52	2	382.26	2.14
		342	178.3	

*p< 0.05

**p< 0.01

***p < 0.001

TABLE XXIII

Recall of text in its metaphoric sense. Analysis to isolate simple main effects of the higher order interaction. (Testtime x Cue x Presentation).

Source of variation	SS	df	MS	F
Cue at Simultaneous Immediate	5183.40	2	2591.70	14.54***
Cue at Before Immediate	2078.56	2	1039.28	5.83**
Cue at After Immediate	152.10	2	76.05	0.43
Cue at Simultaneous Delayed	6309.91	2	3154.96	17.69***
Cue at Before Delayed	2855.62	2	1427.81	8.01***
Cue at After Delayed	1046.00	2	523.00	2.93
		342	178.3	

**p<0.01

***p<0.001

DISCUSSION

When subjects did not have the information about the metaphoric sense, at all, they could not interpret the text in this sense.

In general, when a metaphoric cue related to the text was given before subjects read it, it facilitated their subsequent recall, as one might expect.

An interesting result came out in Presentation Simultaneous and Precue conditions. Subjects did not suffer any forgetting over time. It seemed that subjects did not take advantage of the cue when they were tested immediately, and that could explain why their performance was low. This result contradicts the data that text titles given at the beginning of texts do have a facilitating effect on free recall (Schwart and Flammer, 1981; Alba et al. 1981).

In this experiment, the subjects were psychology students and interpreted the cue as an experimental device to cause forgetting rather than metaphoric. Although that is an "ad hoc explanat. it might be interesting to test it with different subjects. The same trend of results was found in Presentation and Before and After. Although performance at Before Precue Immediate was higher than Simultaneous, it was not statistically significant.

With respect to Simultaneous Precue Delayed, subjects had enough time to elaborate the text in its metaphoric sense, ("to chew over it"), to make sense between the cue, and what they read and saw in the learning task. This result supports the finding of Anderson and collaborators, (Pichert and Anderson, 1977; Anderson and Pichert, 1978), that recall of important ideas to their perspective increased over time.

This result also confirms the theory of, "depth of processing", of Craik and collaborators, (Craik and Lockhart, 1972; Craik and Tulving, 1975; Jacoby and Craik. 1979; Craik, 1981; J.R. Anderson and Reder, 1979), in the sense that the more elaborated a text is, ("deep"), the better the performance.

When the cue was given at recall, (Postcue), after reading the text, forgetting over time occurred. In this condition, when they were tested immediately, it looks as if subjects said to themselves, "EUREKA", now the text made sense. They were able to re-elaborate it again with the cue. In the same trend, titles (Kozminsky, 1977; Johnson, 1981) or shift perspective (Pichert and Anderson, 1977; Anderson, 1978; Anderson and Pichert, 1978; Flammer and Tauber, 1981; Fass and Schumacher, 1981) could alter the comprehension and recall of immediate recall. This re-elaboration of the material with the cue contradicts the results that presentation of title was not effective if given after text reading (Dooling and Lachman, 1971; Bransford and Johnson, 1972; Dooling and Mullet, 1973).

The fact that subjects could be able to re-elaborate the material at Postcue might be interpreted as ing that schema could be formed as well at retrieval (Anderson, 1978), arguing against the constructive view of forming schema only at encoding.

These data have been related to the "encoding specificity" hypothesis (Tulving and Thompson, 1973) in the sense that subjects had a better performance of recall when there is a context match of information between encoding and retrieval.

The results reported with Postcue Immediate contradict this hypothesis, because the context given at encoding (without the cue) was different from the one at retrieval (with the cue) in comparison to Precue conditions.

As predicted, when subjects were presented simultaneously pictures and text, their recall performance for text in its metaphoric sense was better in general. It seems that when the task is more difficult, subjects need to have the "appropriate context" to encode and retrieve the material. If that is so, it argues against Bransford and Johnson's results, and the experiment reported in the second Chapter, in the sense that if subjects had the appropriate information (pictures) before or simultaneously the text, their performance should be better. It might be that the appropriate context depends on the task. If the task is more difficult, it might be necessary to have the context with the text.

The last comment to make is that either with Presentation Before or After, the task is more difficult than Simultaneous to comprehend and recall the material in its metaphoric sense in Postcue conditions. Subjects looked at the pictures or heard the text, and they switched over the tasks, and the metaphoric cue was given after they read it (Postcue). In both tasks it seems quite difficult to make sense at a metaphoric level.

III.A.3.) RECALL OF PICTURES (P).

The criteria for recalling details of pictorial mater were also set up a priori by the three judges.Maximum score was 60 details.Interjudge's reliability(Pearson correlation) was .99($p < 0.001$). A third judge was also introduced in the event of disagreement between the two judges, and his score was considered as the correct one (Appendix V).

Mean proportions of details recalled are shown in Table XXIV and plotted in Figure XI.Inspection of this figure showed that recall of pictures decreased over time in the three presentations. But Before seemed to have a better performance than the other two. Precue might help to recall them, in Presentation Before and After, but in Simultaneous Presentation was the same.Postcue might not improve recall.

An analysis of variance was carried out on the data transformed by arc sine in degrees, to see whether there were differences amongst the conditions (Table XXV).

The only significant reults were the three main factors : Testtime ($F(1,342) = 18.115$, $p < 0.001$), Cue ($F(2,342) = 7.612$, $p < 0.001$) and Presentation ($F(2,342) = 31.443$, $p < 0.001$).

Immediate was significantly better than Delayed conditions (see Table XXIV and also Figure XI).

It would be interesting to look at the differences amongst the levels of factor Cue (Nocue,Precue and Postcue) and Presentation (Simultaneous,Before and After).

TABLE XXIV

MEAN PROPORTIONS OF DETAILS OF PICTURES RECALLED (P)

PRESENTATION	CUE	TEST	$\bar{X}$
	NOCUE	IMMEDIATE	0.38
	NOCUE	DELAYED	0.29
SIMULTANEOUS	PRECUE	IMMEDIATE	0.31
	PRECUE	DELAYED	0.31
	POSTCUE	IMMEDIATE	0.27
	POSTCUE	DELAYED	0.21
	NOCUE	IMMEDIATE	0.46
	NOCUE	DELAYED	0.39
BEFORE	PRECUE	IMMEDIATE	0.48
	PRECUE	DELAYED	0.36
	POSTCUE	IMMEDIATE	0.41
	POSTCUE	DELAYED	0.37
	NOCUE	IMMEDIATE	0.35
	NOCUE	DELAYED	0.33
AFTER	PRECUE	IMMEDIATE	0.37
	PRECUE	DELAYED	0.33
	POSTCUE	IMMEDIATE	0.32
	POSTCUE	DELAYED	0.29

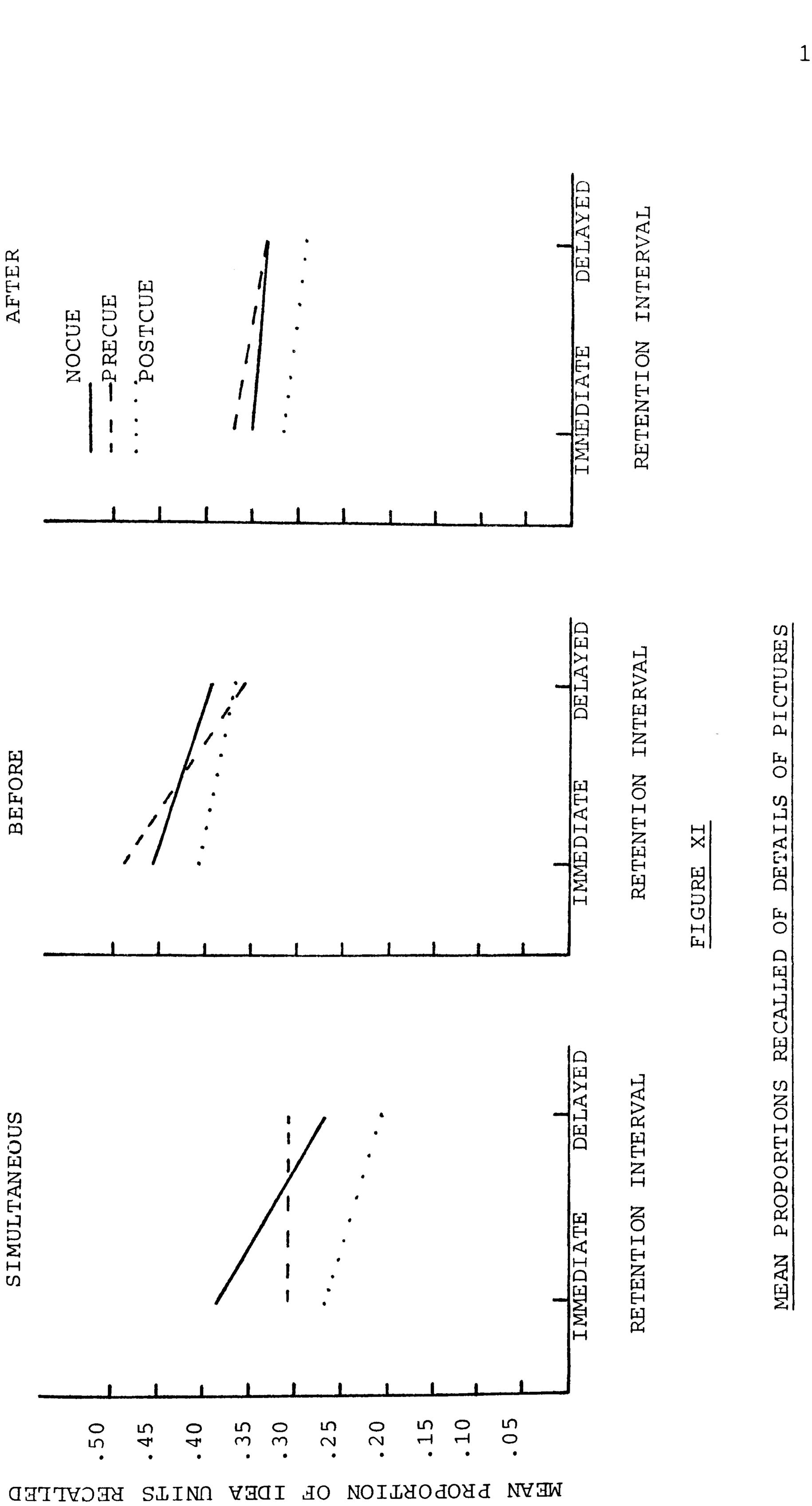


FIGURE XI

MEAN PROPORTIONS RECALLED OF DETAILS OF PICTURES

TABLE XXV

ANALYSIS OF VARIANCE FOR RECALL OF PICTURES.(P)

SOURCE OF VARIATION	SS	DF	MS	F
TESTTIME	950.32	1	950.32	18.115***
CUE	798.61	2	399.30	7.612***
PRESENTN	3298.98	2	1649.49	31.443***
TESTTIME.CUE	18.66	2	9.33	0.178
TESTTIME.PRESENTN	125.04	2	62.52	1.192
CUE.PRESENTN	235.70	4	58.93	1.123
TESTTIME.CUE.PRESENTN	272.76	4	68.19	1.300
RESIDUAL	17940.98	342	52.46	
TOTAL	23641.04	359	65.85	

***p<0.001

Newman - Keuls tests were carried out to determine these differnces.Looking at factor Cue (Table XXVI), Nocue was significantly better than Postcue,but not significantly higher than Precue(see Figure XI), and Precue was significantly better than Postcue.

Looking at Presentation factor (Table XXVII), Before Presentation was significantly better than Simultaneous and After Presentations, but no significant differences between After and Simultaneous Presentations were found (see also Figure XI).

TABLE XXVI

Newman-Keul's Test on Recall of pictures (P) to see the differences among Factor Cue.

	Postcue	Precue	Nocue		
Cue	4038.00	4401.60	4431.60	r	CRN-K
Postcue=4038.00	-	363.20*	393.60*	3	294.52
Precue=4401.60		-	30.00	2	246.23
Nocue=4431.60			-	-	

*p<0.05

TABLE XXVII

Newman-Keul's Test on Recall of Pictures (P) to see differences among Factor Presentation.

	Simultaneous	After	Before		
Presentation:	3914.40	4174.80	4782.00	r	CRN-K
Simultaneous=3914.40	-	260.40	867.60*	3	294.52
After = 4174.80		-	607.20*	2	246.23
Before = 4782.00			-	-	

*p<0.05

DISCUSSION

The first significant factor to be accounted for was Presentation. Before was significantly better than both Presentation After and Simultaneous. Subjects in the latter condition showed the poorest performance, although their differences from subjects in Presentation After did not reach a statistical significance.

It is important to emphasise that the pictures used in this experiment were real-life sportive events, scenes rather than drawings. Details of these scenes that subjects would be able to recall later on would be integrated into a general action schema representing each picture. The elaboration of this schema would be more easily formed if the pictures are presented before the text than when Presentation coincides with the text (Simultaneous) or when the latter has already been encoded (After). In any case, the presentation of the pictures alone without a text should increase the recall of their details in comparison to text and pictures presented simultaneously. Subjects seem to attempt to make sense of the pictures and form a schema that guide their comprehension of visual events. (Bransford, 1979; Goodman, 1980).

Since subjects had a better performance in Before Presentation, this result would support the constructive processing approach by which schema is formed at encoding.

Many theories have assumed (Anderson, 1976, 1980; Anderson and Bower, 1973; Friedman, 1979; Kintsch, 1976; Pylyshyn, 1973) that an abstract form of representation underlies our ability to comprehend and retain visual and

verbal events. They argued against the dual-code theory (Paivio, 1971) which postulated two different systems (linguistic vs visual).

The second significant factor was Testtime. In general, Immediate was better than Delayed conditions. Forgetting occurred over time as one might expect.

The last significant factor was Cue. Recall of pictures in Nocue and Precue conditions were significantly better than in Postcue.

Again, one might interpret these results in terms of an additional information that interferes with the processing of the pictures. From this perspective, Nocue conditions would be defined as the absence of this interference, i.e. subjects encoded directly the materials, forming the corresponding schemata. On the contrary, Precue and Postcue conditions would add an extra-information that might interfere with this process.

As the results showed that Precue did not differ significantly from Nocue, while it did from Postcue, it seems that this interference is less acute when the cue was presented before the material than when it was given to the subjects after they have already encoded it. It might be possible that Precue conditions could induce expectations to the subjects that are discarded once the pictures are presented as not relevant to them. However, in Postcue conditions, the schema would be affected by the subsequent presentation of the cue, in an attempt to organise it.

The fact that there was not any significant interaction could be attributed to the mild interference effect of Precue Immediate in Before Presentation.

III.B) WITHIN- MATERIALS.

In this block of results, statistical analyses were made within-materials, that is, recall of subjects on the different materials, recall of text in its literal sense (LT), in its metaphoric sense (MT), and of pictures (P), according to the different conditions.

The purpose was to compare the performance of subjects on the recall of these three materials. On the previous block of results analysed (Between-subjects), recall of P seemed to be better, then recall of LT, and finally of MT (see Tables IX, XV, and XXIV). To see more clearly these comparisons, three different plottings of results were done in relation to the four main factors (Figures XII, XIII, and XIV). Looking at these three figures, it seems that higher-order interactions were present.

This block of results could be divided into two sections. The first one refers to the analysis of variance carried out on the data to examine whether there were differences between the conditions, and the second one to test the dependence and correlations between the different materials.

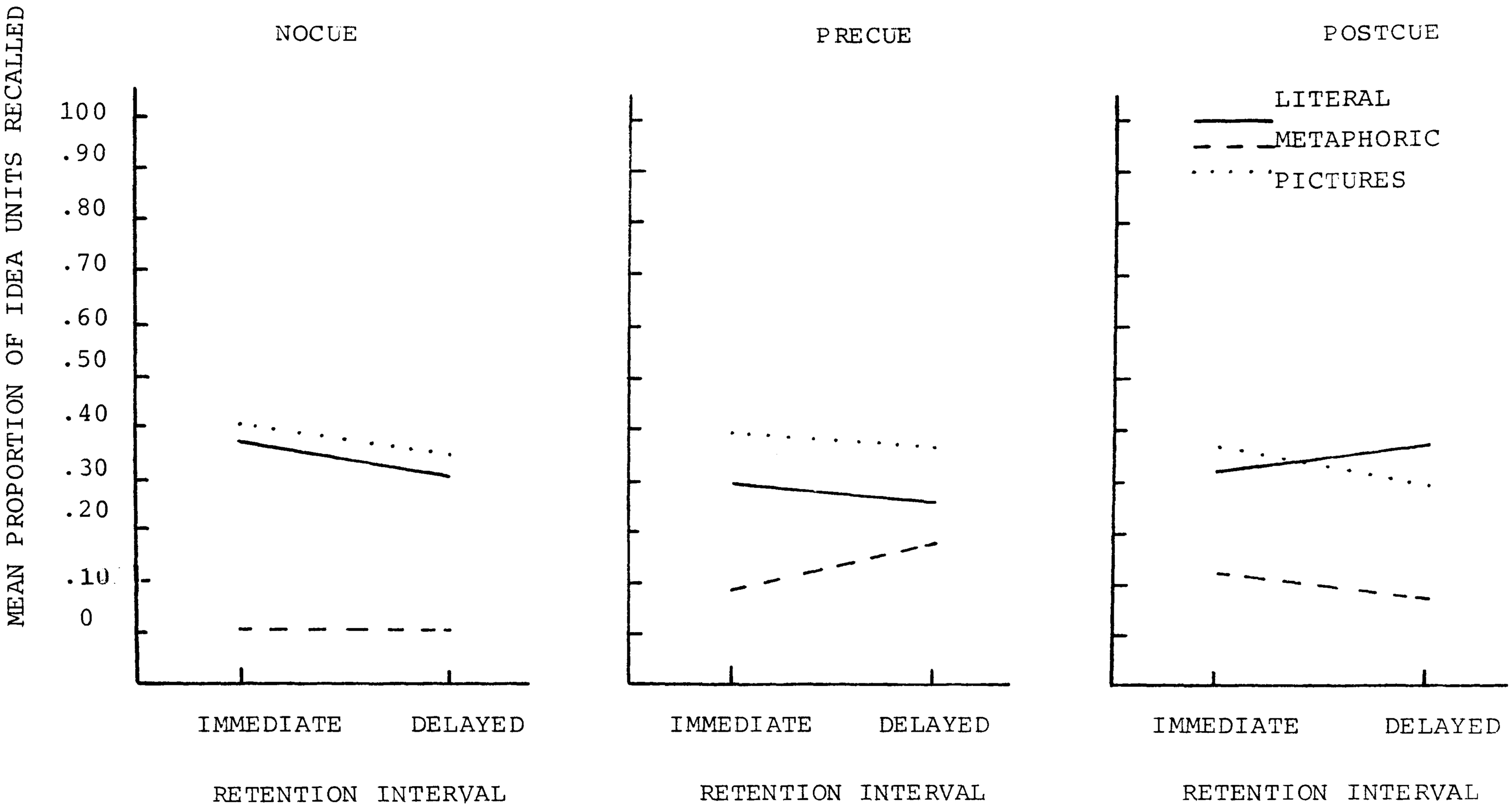


FIGURE XII

MEAN PROPORTIONS OF RECALL OF TEXT EITHER IN ITS LITERAL OR METAPHORIC SENSE AND OF PICTURES WITH REGARDS TO TESTTIME AND CUE.

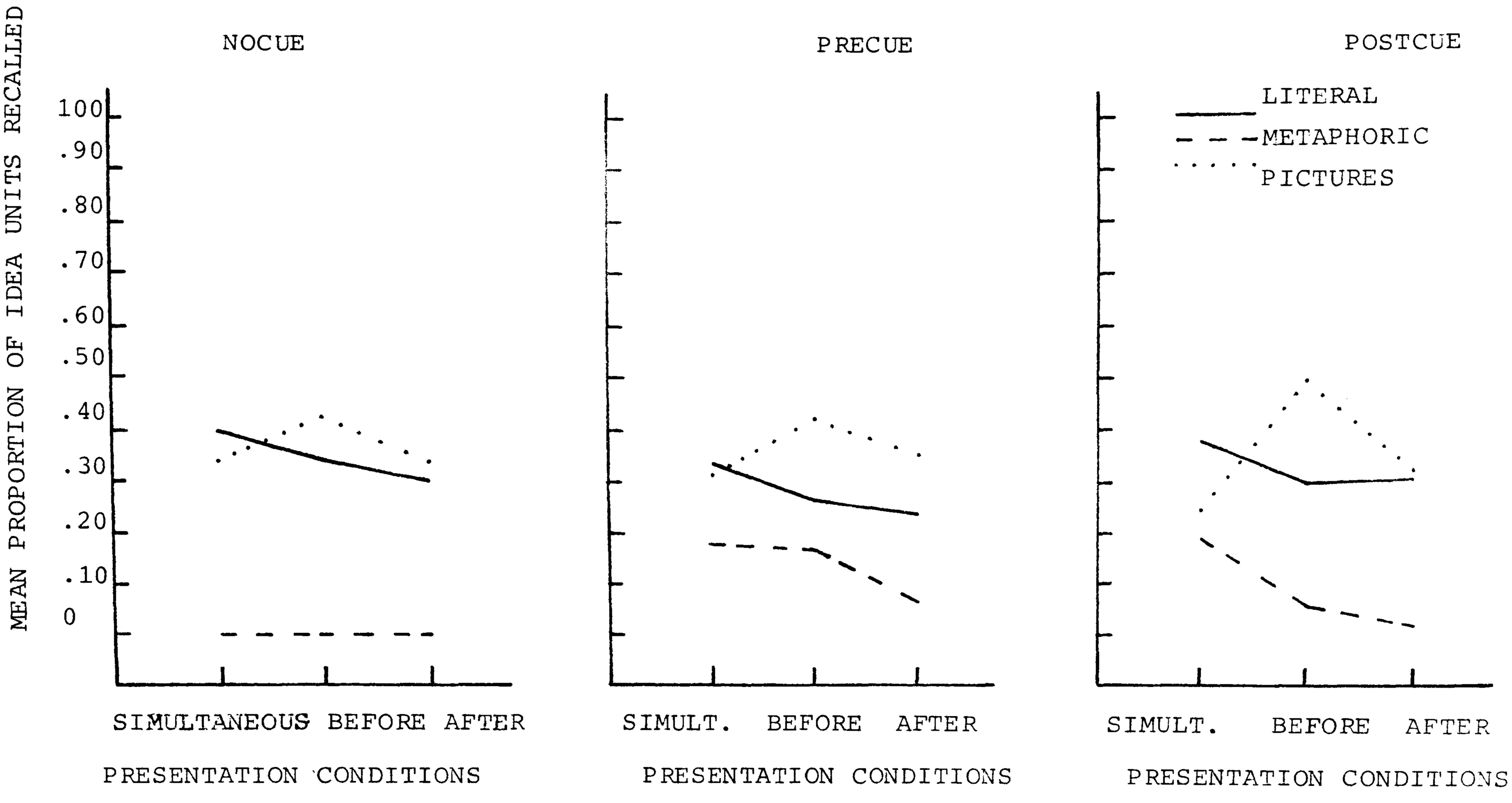


FIGURE XIII

MEAN PROPORTIONS OF RECALL OF EITHER TEXT IN ITS LITERAL OT METAPHORIC SENSE AND OF PICTURES WITH REGARDS TO PRESENTATION AND CUE.

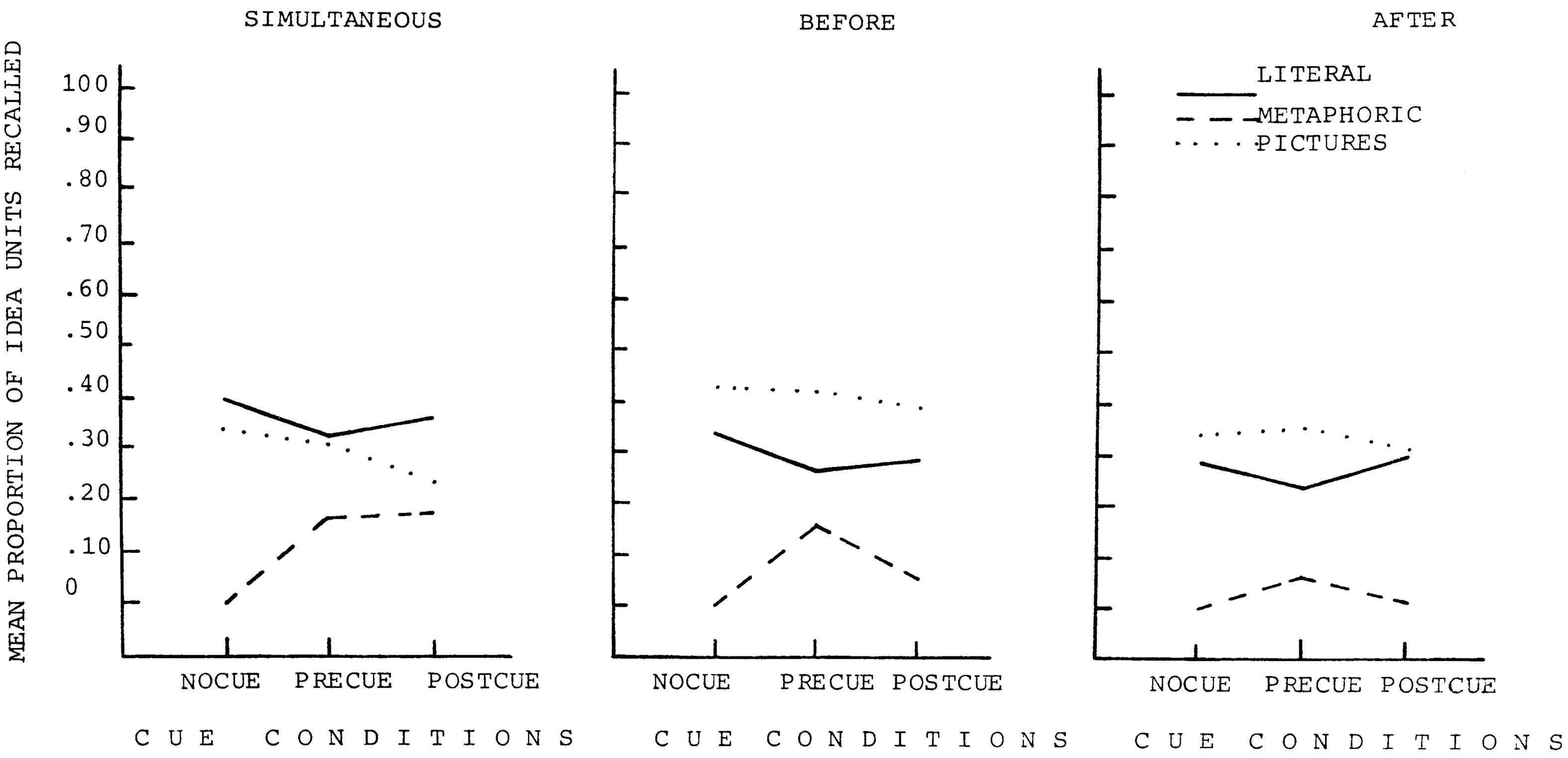


FIGURE XIV

MEAN PROPORTIONS OF RECALL OF EITHER TEXT IN ITS LITERAL OR METAPHORIC SENSE AND OF PICTURES WITH REGARDS TO CUE AND PRESENTATION.

III.B.I) ANALYSIS OF VARIANCE.

An analysis of variance was carried out on the data(Table XXVIII) with four factors, with repeated measures on the last factor (Material).The results showed that the four main factors were highly significant,in general. Testtime ($F(1,\infty) = 4.28$, $p<0.05$) : Cue ($F(2,\infty) = 6.33$, $p\ 0.01$) ;Presentation ($F(2,\infty) = 15.728$, $p<0.001$) and Material ($F(2,\infty) = 1003.854$, $p<0.001$). Some of the triple interactions were also significant: Material x Testtime x Cue ($F(4,\infty)=6.87$, $p<0.001$): Material x Cue x Presentation ($F(4,\infty)=4.05$, $p<0.001$, and so were some of the simple interactions: Material x Testtime ($F(2,\infty)=4.968$, $p<0.01$); and Material x Cue ($F(4,\infty)=29.738$, $p<0.001$) and finally Material x Presentation($F(4,\infty)=18.481$, $p<0.001$).

Because of the possible confoundings of either the main factors or simple interactions, further analyses were made on these two higher-order significant interactions to isolate the simple interaction effects.

First of all,Material x Testtime x Cue was considered.Material x Cue significant interaction was examined at different levels of Testtime. It was found to be highly significant, both at Immediate and Delayed conditions (Table XXIX).

TABLE XXVIII

Analysis of variance. Recall of text in its literal and metaphoric sense and recall of pictures (2 x 3 x 3 x (3 x S)

SOURCE OF VARIATION	SS	DF	MS	F
SUBJECTS STRATUM				
TESTTIME	520.55	1	520.55	4.283*
CUE	1540.70	2	770.35	6.338**
PRESENTN	3823.18	2	1911.59	15.728***
TESTTIME.CUE	525.58	2	262.79	2.162
TESTTIME.PRESENTN	298.16	2	149.08	1.227
CUE.PRESENTN	541.09	4	135.27	1.113
TESTTIME.CUE.PRESENTN	503.91	4	125.98	1.037
RESIDUAL	41565.89	342	121.54.	1.335
TOTAL	49319.05	359	137.38	1.509
SUBJECTS. MATERIAL STRATUM				
MATERIAL	182743.63	2	91371.81	1003.854***
MATERIAL.TESTTIME	907.62	2	453.81	4.986**
MATERIAL.CUE	10827.04	4	2706.76	29.738***
MATERIAL.PRESENTN	6728.77	4	1682.19	18.481***
MATERIAL.TESTTIME.CUE	2503.82	4	625.95	6.877***
MATERIAL.TESTTIME.PRESENTN	7.32	4	1.83	0.020
MATERIAL.CUE.PRESENTN	2951.60	8	368.95	4.053***
RESIDUAL	62986.56	692	91.02	
TOTAL	269656.13	720	374.52	
GRAND TOTAL	318975.13	1079		

*p<0.05
**p<0.01
***p<0.001

TABLE XXIX

Recall of different materials. Analysis to isolate simple interaction effects of the higher order interaction (Material x Testtime x Cue)

Source of variation	SS	df	MS	F
Cue x Material at Immediate	5091.98	4	1273	13.99***
Cue x Material at Delayed	8239.94	4	2059.99	22.63***
Residual			91.02	

***$p < 0.001$

Newman - Keuls tests were carried out both at Immediate and Delayed conditions, at different levels of Cue (Nocue,precue and Postcue), to see the differences amongst the levels of factor Material (LT,MT and P).

At Nocue Immediate (see Figure XII), recall of P and LT were significantly better than recall of MT. But P and LT were not significantly different (Table XXX).

At Precue Immediate (see Figure XII), recall of P was significantly higher than LT and MT, and the latter was significantly smaller than LT.So at Precue Immmediate, the performance was best at P, then LT and finally MT.(Table XXXI).

At Postcue Immediate(see Figure XII), recall of P and LT were significantly better than MT, but there were not significant differences between the recalls of both senses of the text(Table XXXII).

At Nocue Delayed,(see Figure XII), recall of P and LT differed significantly from MT, but they did not differ significantly from each other (Table XXXIII).

At Precue Delayed (see Figure XII) ,recall of P was significantly better than LT and MT, and the latter was significantly higher than MT (Table XXXIV). So, at Precue Delayed,the performance was best at P, then LT and finally MT.

At Post cue Delayed, (see Figure XII), recall of P and LT were significantly better than MT, but significant differences between P and LT were not found (Table XXXV).

TABLE XXX

Newman-Keul's Test on NoCue-Immediate to see the differences among levels of Factor Material (Literal, Metaphoric and Pictures)

	Metaphoric	Literal	Pictures		
Material:	0	2249.40	2328.6	r	CRN-K
Metaphoric=0	-	2249.40**	2328.6**	3	304.47
Literal=2249.40		-	79.20	2	269.00
Pictures=2328.6			-	-	-

**p < 0.01

TABLE XXXI

Newman-Keul's Test on Precue Immediate to see the differences among levels of factor Material (Literal, Metaphoric and Pictures)

	Metaphoric	Literal	Pictures		
Material:	552.6	1947.6	2301	r	CRN-K
Metaphoric=552.6	-	1395**	1748.40**	3	304.47
Literal=1947.6		-	353.40**	2	269.00
Pictures=2301			-	-	-

**p < 0.01

TABLE XXXII

Newman-Keul's Test on Postcue Immediate to see the differences among levels of factor Material (Literal, Metaphoric and Pictures)

	Metaphoric	Literal	Pictures		
Material:	611	1982.4	2098.8	r	CRN-K
Metaphoric=612	-	1370.4**	1486.8**	3	304.47
Literal=1982.4		-	116.40	2	269.00
Pictures:2098.8			-	-	-

**p < 0.01

TABLE XXXIII

Newman - Keul's Test on Nocue Delayed to see the differences among levels of factor Material(Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures		
Material :	0	1962	2103	r	CR_{N-K}
Metaphoric = 0	-	1962 **	2103 **	3	304.47
Literal= 1962		-	1141	2	269.00
Pictures = 2103			-	-	-

** $p<0.01$

TABLE XXXIV

Newman- Keul's Test on Precue Delayed to see the differences among levels of factor Material (Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures	r	CR_{N-K}
Material :	1021.20	1766.40	2100.60		
Metaphoric = 1021.20	-	745.20 **	1079.40 **	3	304.47
Literal = 1766.40		-	334.20**	2	269.00
Pictures = 2100.60			-	-	-

** $p < 0.01$

TABLE XXXV

Newman - Keul's Test on Postcue Delayed to see the differences among factor Material (Literal, Metaphorical and Pictures).

	Metaphorical	Pictures	Literal		
Material :	342.60	1939.80	2086.80	r	CR_{N-K}
Metaphorical = 342.60	-	1597.2**	1744 **	3	304.47
Pictures = 1939.8		-	147	2	269.00
Literal = 2086.8			-	-	-

** $p<0.01$

Material x Testtime significant interaction was examined at different levels of Cue factor(Nocue,Precue and Postcue). Further analyses were carried out to isolate these simple interaction effects.

The only two significant interactions effects were at Precue and Postcue (Table XXXVI). At Precue, recall of P and of LT deteriorated over time, while recall of MT improved over time. At Postcue, recall of MT declined over time,,but there were notmany differences over time in the other two materials. So, recall of MT was causing the interaction, both at Precue and Postcue (see Figure XIV).

Secondly, Material x Cue x Presentation significant interaction was considered.Taking into consideration Material x Presentation interaction(see Figure XIII),at different levels of Cue factor, highly significant results were found (Table XXXVII).

TABLE XXX VI

Recall of different materials. Analysis to isolate simple interaction effects of higher order interaction (Material x Testcue x Cue).

Source of variation	SS	df	MS	F
Material x Testtime at Nocue	381.43	2	190.72	2.10
Material x Testtime x Precue	2417.14	2	1208.57	13.28**
Material x Testtime x Postcue	614.71	2	307.36	3.38*
Residual			91.02	

*p<0.05

**p<0.01

TABLE XXXVII

Recall of different materials. Analysis to isolate the simple interaction effects of the higher order interaction (Material x Cue x Presentation).

Source of variance	SS	df	MS	F
Material x Presentation at Nocue	1474.10	4	368.53	4.05**
Material x Presentation at Precue	2351.20	4	587.80	6.46***
Material x Presentation at Postcue	5852.09	4	1463.02	16.07***
Residual			91.02	

**p<0.01

***p<0.01

Newman-Keuls Tests were carried out to see the differences in Material Factor (LT, MT and P) at each level of Cue Factor, (Nocue, Precue and Postcue), combined at each level of presentation Factor.

At Nocue Simultaneous, (see Figures XIII and XIV), reall of LT was significantly better than MT and P, and recall of P was significantly larger than MT (Table XXXVIII). So, the performance of recall was best at LT, then P, and finally MT.

At Nocue Before, (see Figures XIII and XIV), recall of P was significantly better than in both LT and MT, and LT was significantly larger than MT, (Table XXXIX). So, the performance of recall was best at P, then LT, and finally MT.

At Nocue After, (see Figures XIII and XIV), recall of P was significantly better than MT, but there were not significant differences between P and LT (Table XL).

At Precue Simultaneous, (see Figures XIII and XIV), recall of LT and P were significantly larger than in MT, but no significant differences were found between LT and P (Table XLI).

At Precue Before (see Figures XIII and XIV), recall of P was significantly better than in LT and MT, and recall of LT was significantly larger than MT (Table XLII). So, performance of recall was best at P, then LT and finally MT.

At Precue After (see Figures XIII and XIV), recall of P was significantly better than LT and MT, and recall of LT was significantly larger than MT (Table XLIII). So, performance was best at P, then LT and finally MT.

TABLE XXXVIII

Newman-Keuls Test on Nocue Simultaneous to see the differences among different levels of material (Literal, Metaphoric and Pictures).

	Metaphoric	Pictures	Literal		
Material:	0	1404.8	1576	r	CRN-K
Metaphoric = 0	-	1404.8**	1576**	3	248.60
Pictures = 1404.8		-	171.20*	2	167.14
Literal = 1576			-		

* $p < 0.01$

** $p < 0.01$

TABLE XXXIX

Newman-Keuls Test at Nocue Before to see the differences among different levels of material (Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures		
Material:	0	1385.6	1619.6	r	CRN-K
Metaphoric = 0	-	1385.6**	1619.6**	3	248.60
Literal = 1385.6		-	234**	2	219.64
Pictures =1619.6			-		

** p< 0.01

TABLE XL

Newman-Keuls Test on Nocue After to see differences among levels of material (Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures		
Material:	0	1249.6	1407.2	r	CRN-K
Metaphoric = 0	-	1249.6**	1407.2**	3	248.60
Literal - 1249.6		-	157.6	2	167.14
Pictures =1407.6			-	-	-

** p<0.01

TABLE XLI

Newman-Keuls Test on Precue Simultaneous to see the differences among levels of material (Literal, Metaphoric and Pictures).

	Metaphoric	Pictures	Literal		
Material:	689.2	1346.8	1393.6	r	CRN-K
Metaphoric= 689.2	-	657.6**	704.4**	3	248.60
Pictures = 1346.8		-	46.8	2	219.64
Literal = 1393.6			-	-	-

** $p < 0.01$

TABLE XLII

Newman-Keuls Test on Precue Before to see the differences among levels of material (Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures		
Material:	612.4	1207.4	1621.2	r	CRN-K
Metaphoric = 612.4	-	595**	1008.8**	3	248.60
Literal = 1207.4		-	413.8*	2	219.64
Pictures = 1621.1			-		

** $p < 0.01$

TABLE XLIII

Newman-Keuls Test on Precue After to see the differences among levels of material (Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures		
Material:	272.4	1112.8	1433.6	r	CRN-K
Metaphoric = 272.4	-	840.8**	1161.2**	3	248.60
Literal = 1112.8		-	320.8**	2	219.64
Pictures = 1433.6			-		

** $p < 0.01$

At Postcue Simultaneous, (see Figures XIII and XIV) recall of LT was significantly better than MT and P, and recall of P was significantly larger than MT (Table XLIV). So, performance of recall was best at LT, then at P and finally at MT.

At Postcue Before, (see Figures XIII and XIV) recall of P was significantly better than LT and MT, and recall of LT was significantly larger than MT (Table XLV). So, performance of recall was best at P,then at LT and finally at MT.

At Postcue After,(see Figures XIII and XIV) recall of P and LT was significantly better than MT, but the differences between P and LT were not found to be significant.(Table XLVI).

Finally, Material x Cue significant interaction was examined at different levels of Presentation (Simultaneous, Before and After). Further analysis were carried out to isolate these simple interaction effects (Table XLVII). The results showed that these simple interactions were highly significant at each level of Presentation (see Figure XIV).

At Simultaneous Presentation, recall of LT deteriorated at Precue as represented in Figure XIV, recall of P decreased mainly at Precue, and recall of MT improved at both Precue and Postcue conditions.

At Presentation Before, recall of P remained the same for all Cue conditions while recall of LT was poor at Precue. Recall of MT improved also at Precue,but performance declined at Postcue.

At Presentation After, recall of P remained the same

in all Cue conditions, recall of LT also deteriorated at Precue and recall of MT had its higher performance at Pre-cue,i.e. the opposite trend than recall for LT.

TABLE XLIV

Newman-Keuls Test on Postcue Simultaneous to see the differences among levels of material,(Literal, Metaphoric and Pictures).

	Metaphoric	Pictures	Literal		
Material:	666.8	1163.2	1506	r	CRN-K
Metaphoric: 666.8	-	496.4**	839.2	3	248.60
Pictures: 1163		-	342.8**	2	219.64
Literal: 1506			-	--	-

** p<0.01

TABLE XLV.

Newman-Keuls Test on Postcue Before to see the differences among levels of material. (Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures		
Material:	215.6	1257.2	1540.8	r	CRN-K
Metaphoric = 215.6	-	1041.6**	1325.2**	3	248.60
Literal = 1257.2		-	283.60**	2	219.64
Pictures = 1540.8			-		

** $p < 0.01$

TABLE XL VI

Newman-Keuls Test on Postcue After to see the differences among levels of material (Literal, Metaphoric and Pictures).

	Metaphoric	Literal	Pictures		
Material:	72	1306	1334	r	CRN-K
Metaphoric = 72	-	1234**	1262**	3	248.60
Literal = 1306		-	28	2	167.14
Pictures = 1334			-	-	-

** $p<0.01$

TABLE XL VII

Recall of materials. Analysis to isolate simple interaction effects of the higher order interaction (Material x Cue x Presentation).

Source of variation	SS	df	MS	F
Material x Cue at Simultaneous	7952.09	4	1988.02	21.84***
Material x Cue at Before	4316.15	4	1079.04	11.85***
Material x Cue at After	1508.77	4	377.19	4.14***
Residual			91.02	

*** $p < 0.001$

III.2.B). Test of independence and Different Coefficient of Correlations between different materials.

This section examined a different test of independence, (Chisquare), carried out between different materials, (LT, MT and P), and the degree of dependence (Table XLVIII)between them, (Contingent Coefficient). Inspection of the data showed that the only significant dependence was between LT and P, although the degree of this dependence was very low.

Coefficients of correlations were computed to see the relationships between the materials. These coefficients were also low in all comparisons, and the only significant results were between LT and P, being the most significant Kendall's correlation.

Different comparisons among the materials were carried out, taking into account Factor Cue (Table XLIX). There was not significant dependence in any of the possible comparisons.

Coefficients of correlations were also calculated between materials in the function of Cue. Results showed that these coefficients were low and the only significant correlations are at Nocue , between LT and P.

TABLE XLVIII

TEST OF INDEPENDENCE AND DIFFERENT COEFFICIENTS OF CORRELATION BETWEEN DIFFERENT MATERIALS IN RECALL.

TESTS	MATERIALS		
	LT-MT	LT-P	MT-P
CHISQUARE (χ^2)	1.80	12.31*	3.84
CONTINGENCY COEFFICIENT (C)	.07	.18	.10
PEARSON CORRELATION (r)	-.04	.15***	-.08
SPEARMAN CORRELATION (ρs)	-.04	.16***	-.08
KENDALL CORRELATION (τ)	-	.14****	-

* $p < 0.05$ *** $p < 0.005$

**** $p < 0.0002$

TABLE XLIX

TEST OF DEPENDENCE AND DIFFERENT COEFFICIENTS OF CORRELATIONS BETWEEN DIFFERENT MATERIALS DEPENDING ON THE CUE, IN RECALL.

TESTS	MATERIALS								
	LT - MT			LT - P			MT - P		
	NOCUE	PRECUE	POSTCUE	NOCUE	PRECUE	POSTCUE	NOCUE	PRECUE	POSTCUE
CHISQUARE (χ^2)	0.00	5.89	2.77	5.93	4.09	5.61	0.00	3.04	4.04
CONTINGENCY COEFFICIENT (C)	0.00	.21	.15	.21	.18	.21	0.00	.15	.18
PEARSON CORRELATION (r)	0.00	.02	.05	.21*	.10	.14	0.00	-.13	.01
SPEARMAN CORRELATION (r_s)	0.00	.02	.03	.21**	.11	.14	0.00	-.11	-.002

* $p<0.05$

** $p<0.01$

DISCUSSION

In very general terms it can be said that recall of pictures was better than any other materials. Recall of text in its literal sense was the intermediate one and recall of text in its metaphoric sense was always the worst one.

The superiority of pictorial recall was been found in the literature (see textbooks on memory i.e. Klatzky, 1980) but in general these experiments have compared pictures or drawings to lists of words. In this experiment, on the contrary, a comparison is made between scenes of real life and text. There are some data supporting the superiority of recalling scenes to sentences. Using a recognition task, Nelson et al.(1974) presented the subjects a given scene represented by a photograph, a one phrase description of the photo, a detailed drawing of the photo and a non-detailed drawing of it. Each subject viewed one of the four types of stimuli and then was given a recognition test. They found that recognition performance for any pictorial stimuli was better than for the verbal descriptions. They did not find significant differences between the pictorial stimuli. Nelson et al. results' confirm the ones reported here in the sense that recall of pictorial material, even scenes, was better than verbal material.

However, an interesting result, which came out from these comparisons, is that, in general, when text and

pictures were presented at the same time (Simultaneous), recall of text in its literal sense was better than pictures, or significant differences between the two materials were not found. It seems that subjects used the pictures as mere illustrations to the text without processing them in detail. Exactly the opposite seems to take place in the case of presenting the pictures before the text, subjects recalled more details of the pictures than ideas of the text in its literal sense.

The fact that subjects need the pictures for recalling the text in its literal sense came also from the dependence of each material. The only significant dependence found was between recall of pictures and text in its literal sense. However, when metaphoric sense was involved, the dependence did not exist. The pictures for this kind of material was not so important for illustrating its metaphoric sense.

Good performance on recalling pictures was correlated to good performance of recalling text in its literal sense. It has to be pointed out that the measure used to recall pictorial material was a verbal description of the details of the pictures rather than a visual recognition test of them, as so often used in many experiments (i.e., Nelson et al., 1974). The task itself of describing verbally pictorial material allows subjects to give more small details of the pictures. For example, subjects remembered general ideas such as Spain was beaten by the

Canadians. However, they remembered details of the pictures such as there were 20 people watching the match on the left of the ground, and about 15 players on the right, and also that below the grades there were 3 advertising posters of Winston, Mercedes and Flex.

The relationship between recall of text in its literal sense and of pictures held only when subjects did not have any metaphoric cue, as if the fact of having the cue changed the pattern completely. In the same trend, when the other materials were compared, no relationships were found. One might expect that processing the text in its metaphoric sense would help to process it in its literal sense, but that was not the case.

The dependence found between recall of pictures and verbal material would argue against the dual-code theory. Paivio (1971; 1978) assumed two independent codes, but as he characterized them, interrelated, i.e. an object can be named and thereby evoked some referential image that was determined by the situational context and subjects' individual experience. Although that could be the case, it might not be necessary to postulate two different codes.

One might argue that the order of recall was always the same for all subjects, ie, literal and/or metaphorical material and then pictorial. Therefore, recall of literal might well enhance recall of the pictures,

being that after all was also verbal. However, if the order was reversed, ie, pictorial and then literal and/or metaphorical, this would enhance the recall of literal because, through recalling details of the pictures, subjects could construct and retrieve a "whole idea" in its literal sense.

Recall of text in its metaphoric sense was found always to be the worst performance. It might be that subjects need a more elaborated processing than the other two and to activate schemata related to the text.

IV) GENERAL DISCUSSION.

As predicted, the best way to recall a text in its literal or metaphoric sense is to be presented simultaneously with the scenes or the pictures that the text referred to. This result confirmed what is done in our daily life while reading a newspaper. The text is read matching the verbal information to the pictorial one. Schemata are activated from the text or from the pictures and, therefore the global information is elaborated in relation to the reader's knowledge.

However, if the pictures were presented before or after the text, subjects' subsequent recall of text in its literal sense deteriorated. Although this result argues against Bransford and Johnson and the results of the experiment reported in the second chapter of this thesis, it is plausible that performance would depend on the specific characteristics of the material being presented to the subjects.When this material is difficult to 'structure' it seems necessary to have the context present to form the adequate schema.

The same trend of results was found for recalling the text in its metaphoric sense. Performance recall was better when pictures and text were presented simultaneously. It did make a difference whether pictures were presented befo-re or after the text, in comparison to a Simultaneous Presentation.

In relation to this metaphoric recall, several important issues have to be pointed out. First of all, when the

metaphoric cue was not given, subjects were not able to understand it in that sense, as it could have been expected. They only comprehended the text in its literal sense, just as a pure description of sportive events, indicating how important a cue could be for metaphoric processing.

Secondly, with this best Presentation (Simultaneous) when the cue was given at learning, before the subjects read the text, they had a better performance if the test was delayed rather than immediate. This result, the most important of this experiment, indicates that processing a metaphor needs time to be elaborated. Subjects in this condition activated schemata to understand it. It appears that when one is reading a metaphoric text, the more is thought about it, the more ideas are picked up. In other words, the more activation of schemata are possible. The importance of this result relies on the fact that forgetting occurred over time with any kind of material, verbal or pictorial. As indeed, it is the case of this same experiment. In order to organize and elaborate a text, time is not only needed (quantitative aspect) but it has to be related to the subjects' knowledge of the world (qualitative aspect). In this aspect, all subjects lived the "traumatic" experience of the political event and they could relate the conveying information to it. In this respect, the material was unique.

The last issue to point out with regard to this mate-

rial is that, when the cue was given at recall (after the subjects read the text), subjects were able to re-elaborate the text. This extra information, the cue, activated the schema for metaphoric meaning and this construction made subjects have a good performance. So, schema can be formed at encoding but also at retrieval (Anderson, 1978).

Giving the cue at learning or at recall can be compared to variables where text title or a shift perspective are introduced. Text titles given at the beg ining of the text do have a facilitating effect on subsequent recall (Bransford and Johnson, 1972; Dooling and Lachman, 1971; Dooling and Mullet, 1973; Alba et al., 1981). The same trend of results were found when a perspective that corresponded to the text was introduced (Pichert and Anderson, 1977; Anderson and Pichert, 1978).

When the title was given after the subjects read the text, it was found not to be effective (Dooling and Lachman, 1971; Dooling and Mullet, 1973; Bransford and Johnson, 1972). However, using as cue a shift perspective subjects could re-elaborate the text with this new perspective (Anderson and Pichert, 1978; Pichert and Anderson, 1977).

About this metaphoric material, it can be said that it was "ecologically valid" (Brunswick, 1955; Neisser, 1976) because subjects lived "vividly" the situation (attempted military coup) and they processed a text related to that situation and to possible future events.

In relation to recall of pictures, the more important result was that recall improved when the pictures were presented before the text. When presented simultaneously

or after the text, performance recall of pictures deteriorated. It seems that subjects draw upon elements of their knowledge-base to interpret them and to provide an effective encoding in their permanent memory. If this is so, schema would be formed at encoding. Mandler and her associates (Mandler and Johnson, 1976; Mandler and Parker, 1976; Mandler and Ritchey, 1977) have called this knowledge a "scene schema".

If subjects made a scene schema in this situation, this would support the data in favour of a unique system of representation - a propositional one - for encoding both verbal and pictorial material (see Anderson, 1980 for a review) arguing against the dual code theory (Paivio, 1971, 1978).

However, this interpretation would leave aside the clear a symetry between verbal and pictorial material. In fact, when subjects were presented the pictures before the text, their recall of details was the best. On the contrary, with a simultaneous presentation of text and pictures, recall of text in both literal and metaphoric sense showed subjects' highest performance. It would be difficult to assess whether this a symetry is an experimental artifact, due to the manipulation of the presentation of materials, or whether it reveals two processes for encoding different materials. Further, recall of visual details was expressed by the subjects verbally. That would imply a system that could transfer visual information already encoded into a verbally encoded one. An

abstract format of the kind previously discussed would be a fair candidate for such a system.

When recall of different materials is analysed, the best performance is recall of pictures in general. There were some exeptions in which this was not found. With a Simultaneous presentation, and when no cue was given or it was at recall, recall of text in its literal sense was better than pictures. This result confirms the data outlined above in the sense that, in order to follow a text, it is necessary to have the pictures to which it refers and which illustrate what the text said.

It was surprising that recall of text in its metaphoric sense was, in general, not very high. The hypothesis was that University students would be able to pick up the metaphoric sense of a text related to such a political event. (*)

There is not much evidence in the literature of the effects of cueing (title,perspective shift or extra information) when recognition tasks are used.

The next chapter examines the role of context in recognition of text in its literal and metaphoric sense and of pictures, using the same materials reported in this chapter.

(*) The effects that the order of recalling (i.e. verbal material first and pictorial material last) might have had on the ininteractions found cannot be specified with the present design. This precise recall order was chosen as a consequence of results obtained in pilot studies (see p.92). The main reason was that pictorial recall might act as a prompt for recalling verbal material and as a cue for metaphoric processing.

CHAPTER IV

RECOGNITION OF TEXT IN ITS LITERAL AND METAPHORIC SENSE AND RECOGNITION OF PICTURES.

I) INTRODUCTION.

In the previous chapter, it was found that in order to recall a text in its literal or metaphoric sense, it was beneficial to have the appropriate context (illustration) shown at the same time as the text. However, for recalling details of pictures, having them presented before the text improved their subsequent recall. When a metaphoric cue was given to the subjects, before reading the text, subjects had a better performance if tested with a delay, it seemed as if this was necessary in order to form the appropriate schema of the whole situation. When the cue was given after they had read the text, they were able to re-elaborate all the information. So, it seems that schema can be formed either at encoding or retrieval.

In the present chapter, the same material is used but with a different performance task - a recognition task. In the literature, the effects of prior or contextual knowledge have been mainly concerned with both comprehension and free recall, but there is not much evidence of the same phenomenon when recognition is tested.

This chapter examines the role of context in the recognition of the three kinds of materials, that is, recognition of text in its literal or metaphoric sense, and of pictures.

The experiment reported in this chapter also has four purposes. First of all, it examines how subjects recognise sentences related to the text, either in their literal or metaphoric sense, without instructing them to remember it in any particular sense.

Secondly, the experiemnt looks at the effects of cueing, either at encoding or retrieval, upon recognition of both the literal and the metaphorical sense of the text. It was expected, as it was found in recall, that the fact of giving a cue at learning would improve subsequent recognition.

Thirdly, presentation of pictorial or verbal information, either presented one before the other or simultaneously, and its effect on subjects' recognition performance is examined. It was expected that the same results would be found as in recall, that is, Simultaneous Presentation would improve verbal recognition but, presenting the pictures before the text would facilitate pictorial information processing.

Finally, forgetting in any of the three materials is examined.

II). Method.

Subjects.

The subjects were three hundred and sixty different Psychology students, who carried out the experiment voluntarily. Their age ranged from seventeen to forty years old. Their age mean was 24.2 . The means were approximately the same for the different groups.

Materials.

There were also two tasks as in the recall experiment: a learning and a performance task. The materials are also described according to them.

Learning Task.

The test was the same as the one used in the recall experiment, reported in the last chapter, (see Tables VII, and Plates 1 and 2).

Performance Task.

The performance task consisted of a recognition task, subdivided into three recognition tasks: recognition of sentences in their literal sense, in their metaphoric sense, and of pictures. Three sheets of paper were given to all subjects with thirty-six sentences on the whole. These sentences were related to the main ideas of the text and were constructed by the three judges employed in the previous experiment.Twelve sentences referred to the literal sense,twelve to the metaphoric and twelve were distractors (see Table L). The th irty-six sentences were typed and ordered randomly on three sheets of paper.

TABLE L

RECOGNITION TASK

AGE: SEX:

INSTRUCTIONS: Put a tick next to the sentences that express the ideas in the text, or those which you think are closest to the meaning.

L -Indoor athletic events are good practice for open air ones.

D -The Spanish team is not very good at hockey on skates.

M -Tanks are supposed to be less dangerous than other mounts, but perhaps the adjective is not quite right.

M -There might have been an important meeting in Jaca to discuss the level of the different members of the Spanish team.

L -The Spanish hockey on skates team is one of the best in the world.

L -Bicycles are not as dangerous as horses.

M -Local events might be used as a rehearsal for entering into national events.

L -The prizes for the competion are on the stand.

M -Although for Anthony the race has been interrupted nothing has happened.

L -Spain won an Olympic Silver Medal in grass hockey.

D -The Pole Kozakiewickz won the pole-vaulting competition, the same as he did in the Olympic Games in Moscow.

M -Those taking part in this winter event might be practising for an event in the summer.

L -New York and Moscow were the seats of two important sporting events.

D -The cycling race to Andalucía takes place before "Le Tour" and "Il Giro".

L -Canada performed outstandingly in the Inter-Universities winter sporting events.

L -The British "Steeplechase" is a selective race for riders who will take part in more famous races such as the Grand National.

D -The best riders in the world take part in the British 'Steeplechase'.

D -Anthony Webber, the English rider, and his mount "Anitacat" won the British "Steeplechase".

M -The Valencia event did not start out from Madrid.

L -Some event,such as "The Three Provinces", provide good training for races on a national scale.

M -Anthony, who had performed so well in other events, was also outstanding in this one.

D -The Spanish hockey team gave the Canadian team a good beating.

M -Although he did not win, he gave his rival a good fright.

D -One has to be qualified in the "Three Provinces" race in order to take part in international events such as "Le Tour" or "Il Giro".

D -The French repeated the victory which was theirs in the Olympic Games at Moscow in the pole-vaulting event.

D -The Polish pole-vaulter Kozakiewickz won the competition at Madison Square Gardens in New York.

L -The French won the pole-vaulting event at Madison Square Gardens in New York.

L -The rider Anthony Webber was disqualified from the British "Steeplechase".

D -The Spanish ice hockey team won an Olympic Sylver Medal.

D -The prizes are awarded at the end of this event.

M -The Valencia race caused a great impact on the people.

M -In Spain events and competitions take place on wheels and we are known worldwide for this.

D -French, English and Polish athletes took part in the Madison Square Gardens games.

L -The Duke of Albuquerque is famous for his presence at international riding events.

M -The situation on skates and grass was good, but on ice either no information was available or it was bad.

M -Engines can be warmed up at indoor competitions, in practice for events of greater significance.

L = sentences referred to the literal sense.

D = sentences that are distractors.

M = sentences referred to the metaphoric sense.

In the pictorial recognition task, twenty-four pictures were photographed, with a size of 9 cm by 12.5 cm. Five of them were related to each of the four pictures presented in the learning task. So, there were twenty distractors chosen from a picture-book about Olympic Games (see Appendix VI). The twenty-four pictures were numbered in the back.

PROCEDURE.

Subjects were divided at random to the different conditions. In all conditions they were also asked to write down age and sex. The experiment was carried out collectively in groups of ten subjects.

The design was the same as in the recall experiment (see Table VIII for a summary of the design), with the same factors and levels. There were twenty subjects in each condition. The instructions and procedure for the learning task were the same as in the recall experiment.

The instructions for the verbal recognition task was as follows: "Put a tick next to the sentence that express the ideas in the text or those which you think are closest to the meaning".

They were asked to answer each sentence one at a time, and not to return to the sentences that they had already answered.

In the pictorial recognition task, different random orders were constructed for each condition. Each subject had a pack of twenty-four pictures, five related to each of the four pictures that they saw in the learning

task.

Subjects reversed and spread out the photographs, with the numbers facing them. In the experiment one number was said at a time, and each subject took the picture and look at it for five seconds and wrote only "Yes" or "No", as to if they thought they had seen the picture before in the learning task. They were given a sheet of paper with twenty-four numbers in a column, and they had to write "Yes" or "No" next to the numbers. So, the first picture that they saw according to random numbers belonged to number one on the sheet of paper, and so on. They were asked to write one at a time.

III) Results

Results are also divided into two main blocks. The first block refers to recognition of sentences in their literal sense (LT), in their metaphorical sense(MT), and of pictures,(P), between subjects. The second block examined the recognition within-materials, that is, the performance of subjects in each task according to conditions.

III.A.) BETWEEN - SUBJECTS.

III.A.I.) RECOGNITION OF SENTENCES IN THEIR LITERAL SENSE.

First of all, sentences recognised correctly in their literal sense only were computed. Mean proportions of these sentences according to the different conditions are shown in Table LI and plotted in Figure XV. Inspection of this figure reveals that recognition, in general, declined over time. Simultaneous Presentation seemed to help recognition. Postcue conditions appear to improve recognition mainly in Before and After Presentation, but not in Simultaneous Presentation. It looks as if an interaction between Cue and Presentation is present.

Secondly, sentences falsely recognised (distractors) were also computed to check whether a high recognition performance and a high rate of falsely recognised sentences were related to each other. That was not the case, as can be seen in Appendix VII. Mean d' values, according to the different conditions, are given in Appendix VIII.

Proportions of sentences recognised correctly were transformed by arc sine in degrees to carry out an analysis of variance, and to see whether there were differences between conditions (Table LII). The three main factors were significant: Testtime ($F(1, 342) = 6.857$, $p < 0.01$); Cue ($F(2, 342) = 3.925$, $p < 0.05$); and Presentation ($F(2, 342) = 14.54$, $p < 0.001$).

The only significant interaction was Presentation and

TABLE LI

MEAN PROPORTIONS OF SENTENCES RECOGNISED

IN THEIR LITERAL SENSE ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	$\bar{X}$
SIMULTANEOUS	NOCUE	IMMEDIATE	0.73
	NOCUE	DELAYED	0.66
	PRECUE	IMMEDIATE	0.61
	PRECUE	DELAYED	0.63
	POSTCUE	IMMEDIATE	0.63
	POSTCUE	DELAYED	0.55
BEFORE	NOCUE	IMMEDIATE	0.61
	NOCUE	DELAYED	0.54
	PRECUE	IMMEDIATE	0.60
	PRECUE	DELAYED	0.54
	POSTCUE	IMMEDIATE	0.65
	POSTCUE	DELAYED	0.61
AFTER	NOCUE	IMMEDIATE	0.60
	NOCUE	DELAYED	0.48
	PRECUE	IMMEDIATE	0.44
	PRECUE	DELAYED	0.47
	POSTCUE	IMMEDIATE	0.57
	POSTCUE	DELAYED	0.55

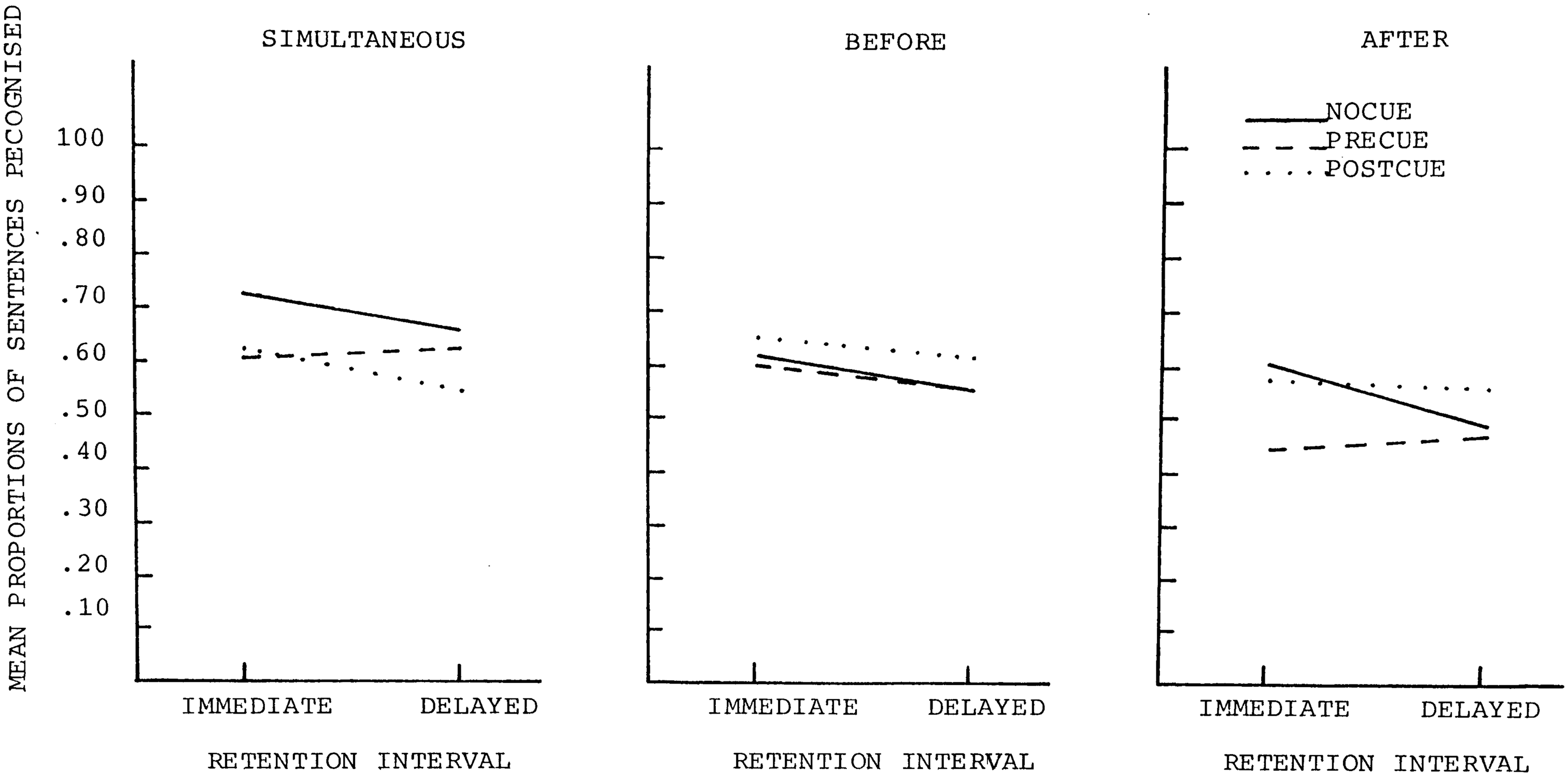


FIGURE XV

MEAN PROPORTIONS OF SENTENCES RECOGNISED IN THEIR LITERAL SENSE

TABLE LII.

ANALYSIS OF VARIANCE FOR RECOGNITION OF SENTENCES IN THEIR LITERAL SENSE.

SOURCE OF VARIATION	SS	DF	MS	F
TESTTIME	725.1	1	725.1	6.857**
CUE	830.1	2	415.0	3.925*
PRESENTN.	3159.4	2	1579.7	14.940***
TESTTIME.CUE	360.1	2	180.1	1.703
TESTTIME.PRESENTN.	39.5	2	19.8	0.187
CUE.PRESENTN.	1367.0	4	341.8	3.232*
TESTTIME.CUE.PRESENTN.	277.7	4	69.4	0.657
RESIDUAL	36162.4	342	105.7	
TOTAL	42921.4	359	119.6	
GRAND TOTAL	42921.4	359		

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Cue ($F(4, 342) = 3.232$, $p < 0.01$), as might be expected. This significant interaction is plotted in Figure XVI. Inspection of this figure shows that, at Simultaneous Presentation, recognition performance declined from Nocue to Precue and from Precue to Postcue conditions. At Presentation Before, recognition remained the same at Nocue and Precue conditions while it improved at Postcue. At Presentation After, recognition deteriorated mainly at Precue conditions.

Because Testtime was not entered either or both with any significant interaction (see Table LII) one can see clearly that Immediate conditions were significantly better than Delayed conditions (see Table LI). However, nothing can be said about the two other main factors on their own until additional analysis were carried out to determine the simple main effects. That is, to assess the variations due to factor Presentation (Table LIII) at different levels of factor Cue (Nocue, Precue, Postcue).

There were only two significant effects: Presentation at Nocue ($F(2, 342) = 9.12$, $p < 0.001$) and Presentation at Precue ($F(2, 342) = 10.60$, $p < 0.001$). Variations due to Presentation were at Nocue and Precue but not at Postcue.

Simultaneous Presentation declined from Nocue to Precue, Presentation Before remained the same at Nocue and Precue. Presentation After declined deeply from Nocue to Precue.

A Newman-Keuls Test was carried out to determine the significance of the differences among levels of Presentation. At Nocue conditions (Table LIV) Simultaneous Presentation was significantly better than Before and

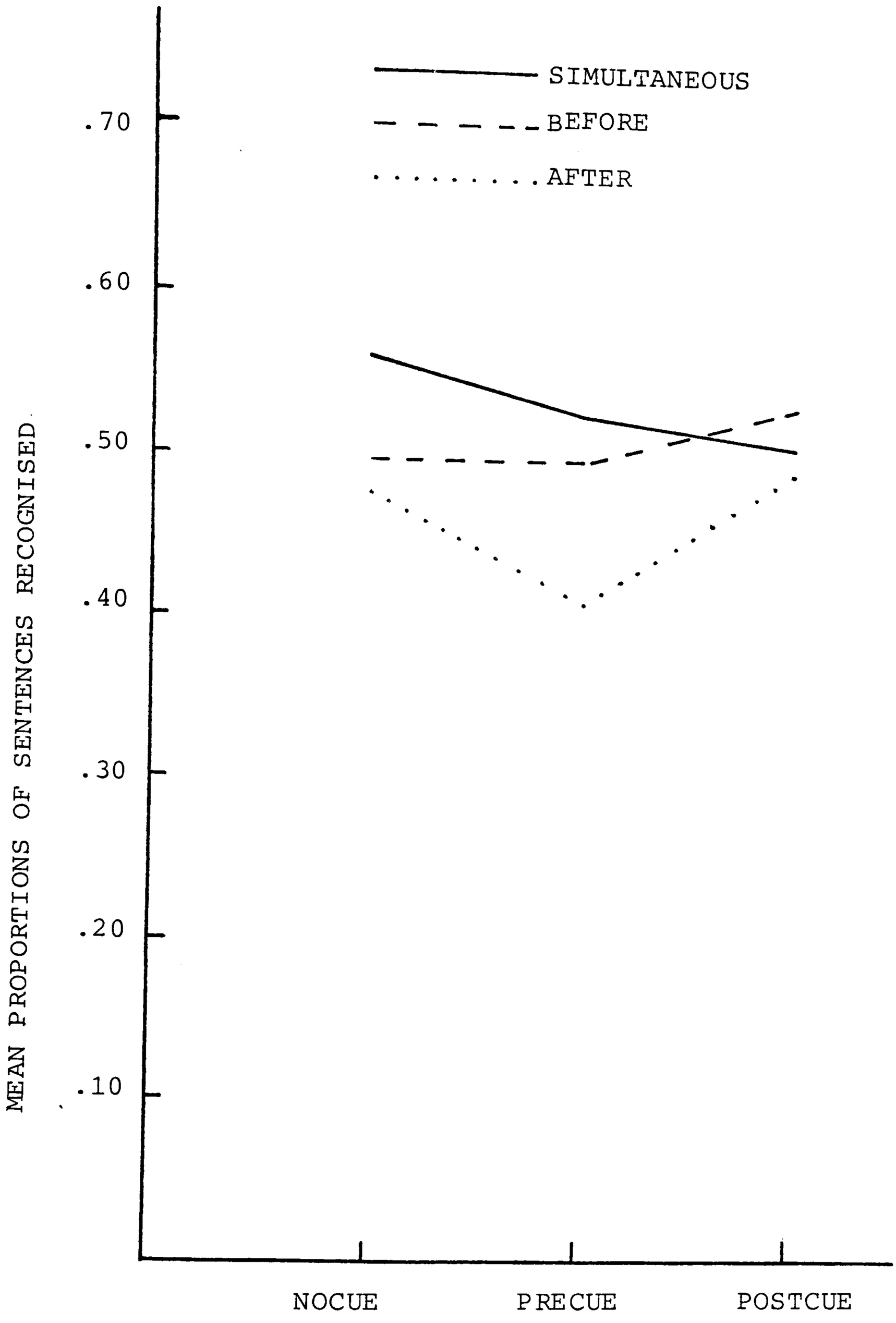


FIGURE XVI

MEAN PROPORTIONS OF SENTENCES RECOGNISED IN THEIR LITERAL SENSE, SHOWING THE PRESENTATION X CUE INTERACTION.

TABLE LIII

RECOGNITION OF SENTENCES IN THEIR LITERAL SENSE. Additional analyses to isolate the simple effects of factor Presentation at different levels of factor Cue.

SOURCE OF VARIATION	SS	df	MS	F
PRESENTATION AT NOCUE	1927.78	2	963.89	9.12***
PRESENTATION AT PRECUE	2239.96	2	1119.98	10.60***
PRESENTATION AT POSTCUE	358.28	2	179.14	1.69
RESIDUAL		342	105.7	

*** $p < 0.001$

TABLE LIV

Newman-Keuls Test on recognition of sentences in their literal sense to look at the differences among factor Presentation in Nocue conditions.

	After	Before	Simultaneous		
Presentation:	1901.00	1977.40	2272.80	r	CRN-K
After = 1901.00	-	76.40	371.80*	3	215.22
Before = 1977.40		-	295.40*	2	180.11
Simultaneous = 2272.80			-	-	-

* p<0.05

After (see Figure XVI). In Precue conditions (Table LV) Simultaneous Presentation was significantly better than After but not significantly larger than Before Presentation (see Figure XVI).

TABLE LV

Newman-Keuls test on recognition of sentences in their literal sense to look at the differences among factor Presentation in Precue conditions.

	After	Before	Simultaneous		
PRESENTATION:	1677.80	1974.60	2087.60	r	CRN-K
After = 1677.80	-	296.80*	409.80*	3	215.22
Before = 1974.60		-	113.00	2	180.11
Simultaneous = 2087.60			-	-	-

* $p<0.05$

III.A.II) RECOGNITION OF TEXT IN ITS METAPHORIC SENSE.

Sentences recognised correctly in their metaphoric sense only were computed. Obviously no distractors were constructed for metaphoric sentences, due to the very nature of the task. And consequently, d' values were not computed either.

Mean proportions of sentences recognised correctly according to the different conditions are shown in Table LVI. The results came out as plotted in Figure XVII. Inspection of this figure shows that the results are quite similar in all conditions. At Simultaneous Presentation, Precue seems to be better at Immediate conditions but it declines over time. However, the opposite effect appears at Before and After Presentations. At Postcue performance improves over time in Simultaneous presentation while no change could be appreciate for both Before and After presentations.

An analysis of variance (Table LVII) was carried out on the data (proportions transformed by arc sine in degrees) to determine the significance of these differences. None of the main factors or their interactions were significant.

The power test (Cohen, 1977) of two main factors, Cue and Presentation (the highest obtained,although not significant) were computed. For both Cue and Presentation the power was 0.38 .

TABLE LVI.

MEAN PROPORTIONS OF SENTENCES RECOGNISED IN THEIR METAPHORIC SENSE ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	$\bar{X}$
SIMULTANEOUS	NOCUE	IMMEDIATE	0.23
	NOCUE	DELAYED	0.21
	PRECUE	IMMEDIATE	0.27
	PRECUE	DELAYED	0.22
	POSTCUE	IMMEDIATE	0.22
	POSTCUE	DELAYED	0.24
BEFORE	NOCUE	IMMEDIATE	0.20
	NOCUE	DELAYED	0.18
	PRECUE	IMMEDIATE	0.20
	PRECUE	DELAYED	0.23
	POSTCUE	IMMEDIATE	0.24
	POSTCUE	DELAYED	0.23
	NOCUE	IMMEDIATE	0.18
	NOCUE	DELAYED	0.19
	PRECUE	IMMEDIATE	0.24
	PRECUE	DELAYED	0.29
	POSTCUE	IMMEDIATE	0.18
	POSTCUE	DELAYED	0.19

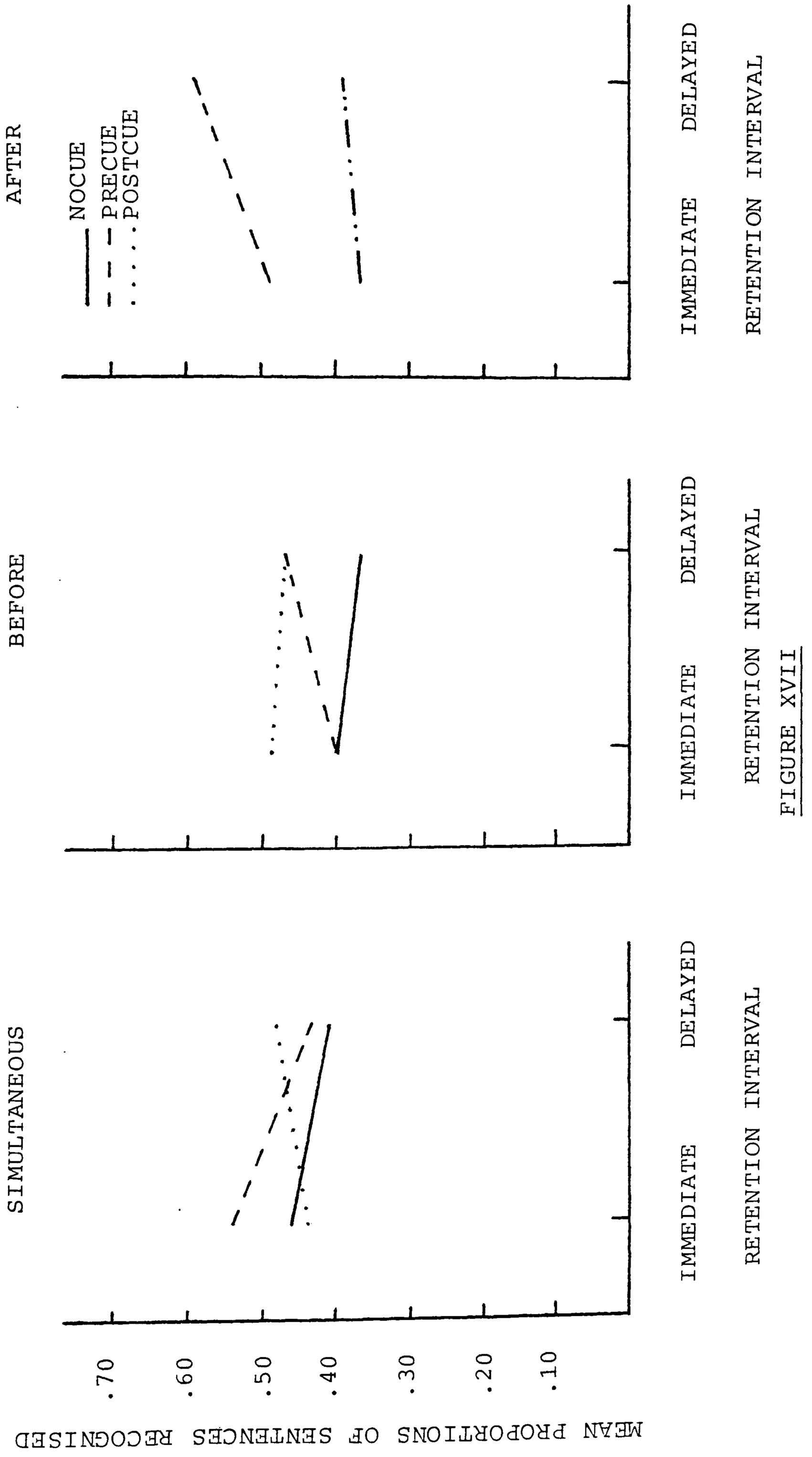


FIGURE XVII

MEAN PROPORTIONS OF SENTENCES RECOGNISED IN THEIR METAPHORIC SENSE

TABLE LVII

Analysis of Variance for Recognition of sentences in their Metaphoric sense.

SOURCE OF VARIATION	SS	DF	MS	F
TESTTIME	21.8	1	21.8	0.161
CUE	573.4	2	286.7	2.112
PRESENTATION	389.3	2	194.6	1.434
TESTTIME.CUE	115.6	2	57.8	0.426
TESTTIME.PRESENTN.	181.5	2	90.7	0.668
CUE.PRESENTN.	489.3	4	112.3	0.901
TESTTIME.CUE.PRESENTN.	272.6	4	68.1	0.502
RESIDUAL	46432.5	342	135.8	
TOTAL:	48475.9	359	135.0	

III.A.III) RECOGNITION OF PICTURES.

First of all, pictures correctly recognised only were computed.Mean proportions of them are shown in Table LVII and plotted in Figure XVIII.Inspection of this figure shows that recognition of pictures was very high. Subjects seems to have a better performance when the pictures were presented before. Performance seems to deteriorate over time at Precue condition in Simultaneous Presentation, and at Postcue in Before Presentation. So, it looks as if a higher-order interaction is present.

Secondly, pictures falsely recognised (distractors) were also scored to check whether a high recognition performance corresponded to a high rate of falsely recognised pictures. That was not the case, as can be seen in Appendix IX. Mean d' values, according to the different conditions are given in Appendix X.

Proportions of pictures correctly recognised were transformed by arc sine in degrees to carry out an analysis of variance (Table LIX).

This analysis of variance showed that the only main significant factor was Presentation ($F(2, 342) = 3.782$, $p < 0.05$) . The higher-order interaction, as expected, was also significant ($F(4, 342) = 2.946$, $p < 0.05$).

TABLE LVIII

MEAN PROPORTIONS OF PICTURES RECOGNISED ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	$\bar{X}$
SIMULTANEOUS	NOCUE	IMMEDIATE	0.90
	NOCUE	DELAYED	0.90
	PRECUE	IMMEDIATE	0.93
	PRECUE	DELAYED	0.83
	POSTCUE	IMMEDIATE	0.86
	POSTCUE	DELAYED	0.88
BEFORE	NOCUE	IMMEDIATE	0.93
	NOCUE	DELAYED	0.98
	PRECUE	IMMEDIATE	0.94
	PRECUE	DELAYED	0.98
	POSTCUE	IMMEDIATE	0.98
	POSTCUE	DELAYED	0.84
AFTER	NOCUE	IMMEDIATE	0.93
	NOCUE	DELAYED	0.91
	PRECUE	IMMEDIATE	0.94
	PRECUE	DELAYED	0.90
	POSTCUE	IMMEDIATE	0.93
	POSTCUE	DELAYED	0.91

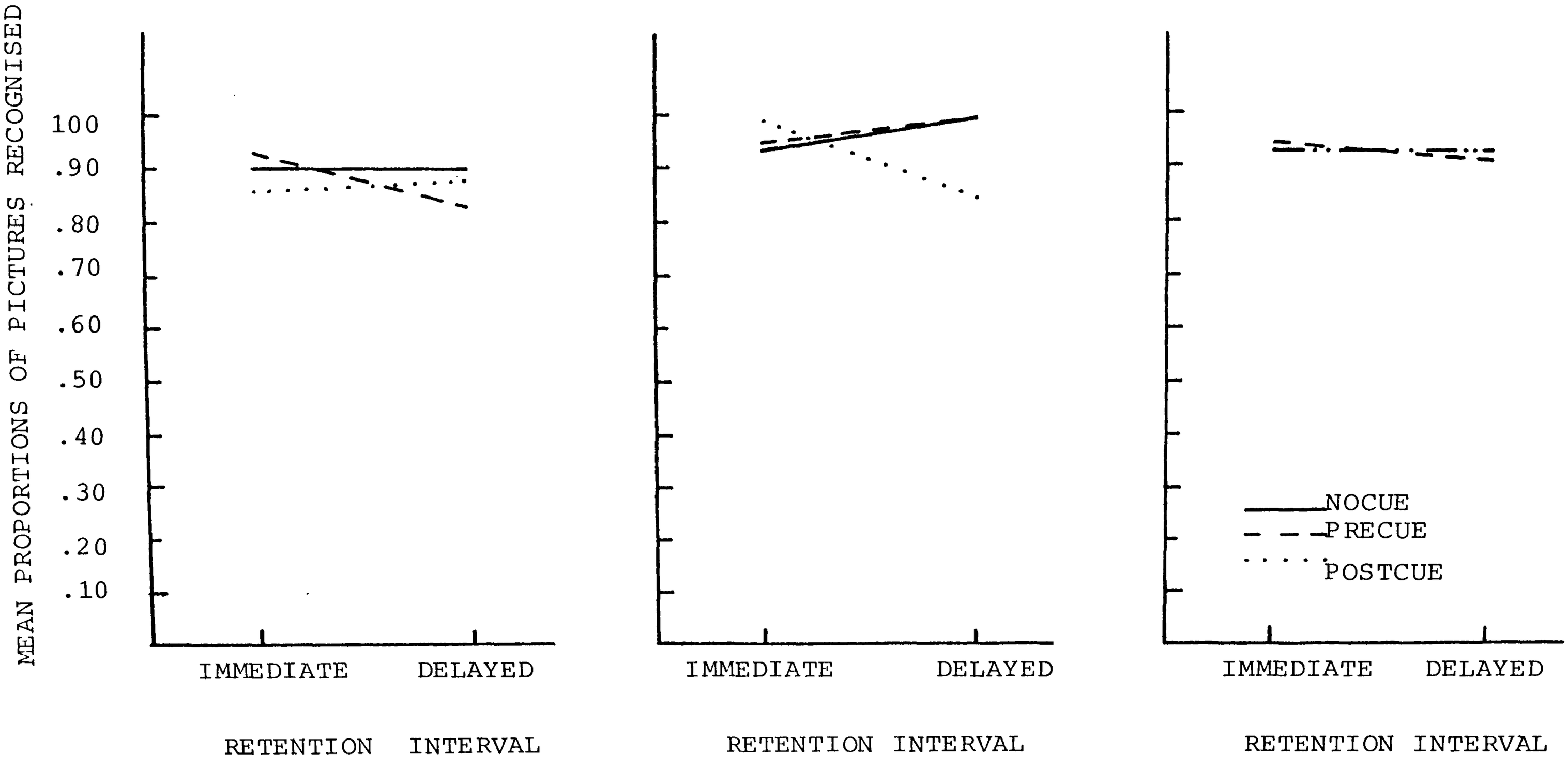


FIGURE XVIII

MEAN PROPORTIONS RECOGNITION OF PICTURES

TABLE LIX

ANALYSIS OF VARIANCE FOR RECOGNITION OF PICTURES.

SOURCE OF VARIATION	SS	DF	MS	F
TESTTIME	599.1	1	599.1	2.474
CUE	824.0	2	412.0	1.702
PRESENTATION	1831.5	2	915.8	3.782*
TESTTIME.CUE	876.3	2	438.2	1.810
TESTTIME.PRESENTN.	19.9	2	10.0	0.041
CUE.PRESENTN.	481.1	4	120.0	0.497
TESTTIME.CUE.PRESENTN.	2853.4	4	713.3	2.946*
RESIDUAL	82812.9	342	242.1	
TOTAL:	90298.3	359	251.5	

* p<0.05

Further analyses were carried out to isolate the simple main interaction effects, mainly Testtime and Cue at different levels of Presentation; and Cue x Presentation at different levels of Testtime (see Figure XVIII).

Looking at Testtime x Cue, the only significant effect was at Before Presentation (Table LX). Postcue condition was causing this interaction, (see Figure XVIII). Forgetting occurred over time only in this condition. When subjects were tested immediately there were not differences among the cue conditions. However, when they were tested with a delay there seem to be significant differences.

A Newman-Keuls Test was done in Before Delayed to see the differences among levels of Cue, (Nocue, Precue and Postcue). Nocue and Precue were significantly better than Postcue, but the first two did not differ significantly from one another, (Table LX I).

Looking at Cue x Presentation at different levels of Testtime (Table LXII), the only significant effect was at Delayed. There are not differences among Presentation at Nocue or Postcue, but there seem to be at Precue.

A Newman-Keuls Test was carried out in Precue Delayed to see the differences among Presentation Factor. Before Presentation was significantly better than Simultaneous Presentation, but it did not differ significantly from After, (Table LXIII).

TABLE LX

ANALYSIS TO ISOLATE SIMPLE MAIN INTERACTION EFFECTS IN THE RECOGNITION OF PICTURES.

SOURCE OF VARIATION	SS	df	MS	F
Testtime x Cue at Simultaneous	852.60	4	213.15	0.88
Testtime x Cue at Before	2736.91	4	684.23	2.83*
Testtime x Cue at After	138.25	4	34.56	0.14
Residual	138.25	4	34.56	0.14

* $p < 0.05$

TABLE LXI

Newman-Keuls Test on Before Delayed to see the differences among levels of Factor Cue.

	Postcue	Nocue	Precue		
Cue:	1424.60	1739.20	1739.20	r	CRN-K
Postcue: 1424.60	-	314.60*	314.60*	3	230.31
Nocue: 1739.20		-	0	2	192.75
Precue: 1739.20			-		

* $p<0.05$

TABLE LXII

ANALYSIS TO ISOLATE SIMPLE MAIN INTERACTION EFFECTS ON RECOGNITION OF PICTURES.

SOURCE OF VARIATION	SS	df	MS	F
Cue x Presentation at Immediate	654.91	4	163.73	0.68
Cue x Presentation at Delayed	2678.21	4	669.55	2.77*
Residual		342	242.10	

* $p < 0.05$

TABLE LXIII

Newman-Keuls Test on Precue Delayed to look at the differences among levels of factor Presentation, in the recognition of pictures.

		Simultaneous	After	Before		
Presentation:		1424.60	1559.60	1739.20	r	CRN-K
Simultaneous:	1424.60	-	135.00	314.60*	3	230.31
After:	1559.60		-	179.60	2	192.75
Before:	1739.20			-		

*p<0.05

III.B. Within-materials.

Under this heading,qualitative analysis were made within-materials,that is,recognition of sentences in their literal sense (LT),in their metaphoric sense (MT),and of pictures (P).

This block of results could be divided into two sections. The first one refers to qualitative comparisons among the performances of subjects on recognition of this three materials.

In the second section,some statistical analyses are made to test the independence and correlations within the different materials.

III.B.II. Qualitative Analyses.

When Material and Cue conditions were plotted (Figure XIX) it seems clear that recognition of pictures show the highest performance with small variations across Cue conditions.It has to be reminded that original pictures in the learning task were present at recognition while both literal and metaphorical sentences were paraphrases of those presented at learning.

The trend of performance in recognition of literal sentences was opposite to that of performance with metaphoric sentences. Performance was better in Precue conditions for metaphoric prose than for literal processing of text. Improvement of recall in Nocue and Postcue conditions,in dealing with literal sense, had a corresponding decrement in both conditions when subjects treated the text metaphorically.

For all three Cue conditions recognition of pictures was higher than recognition of sentences. And recognition of them in its literal sense was always better than recognition of metaphoric sentences.

When Presentation conditions were plotted for performance in recognition of the three different materials (Figure XX) the same pattern appeared. Recognition of pictures was highest in all three conditions than recognition of sentences. And recognition of sentences in its literal sense was always better than performances with metaphoric material in all Presentation conditions.

Looking at Tables LI,LVI, and LVIII Immediate conditions seems better than Delayed conditions.This was also the case in the Between-subjects analyses for literal

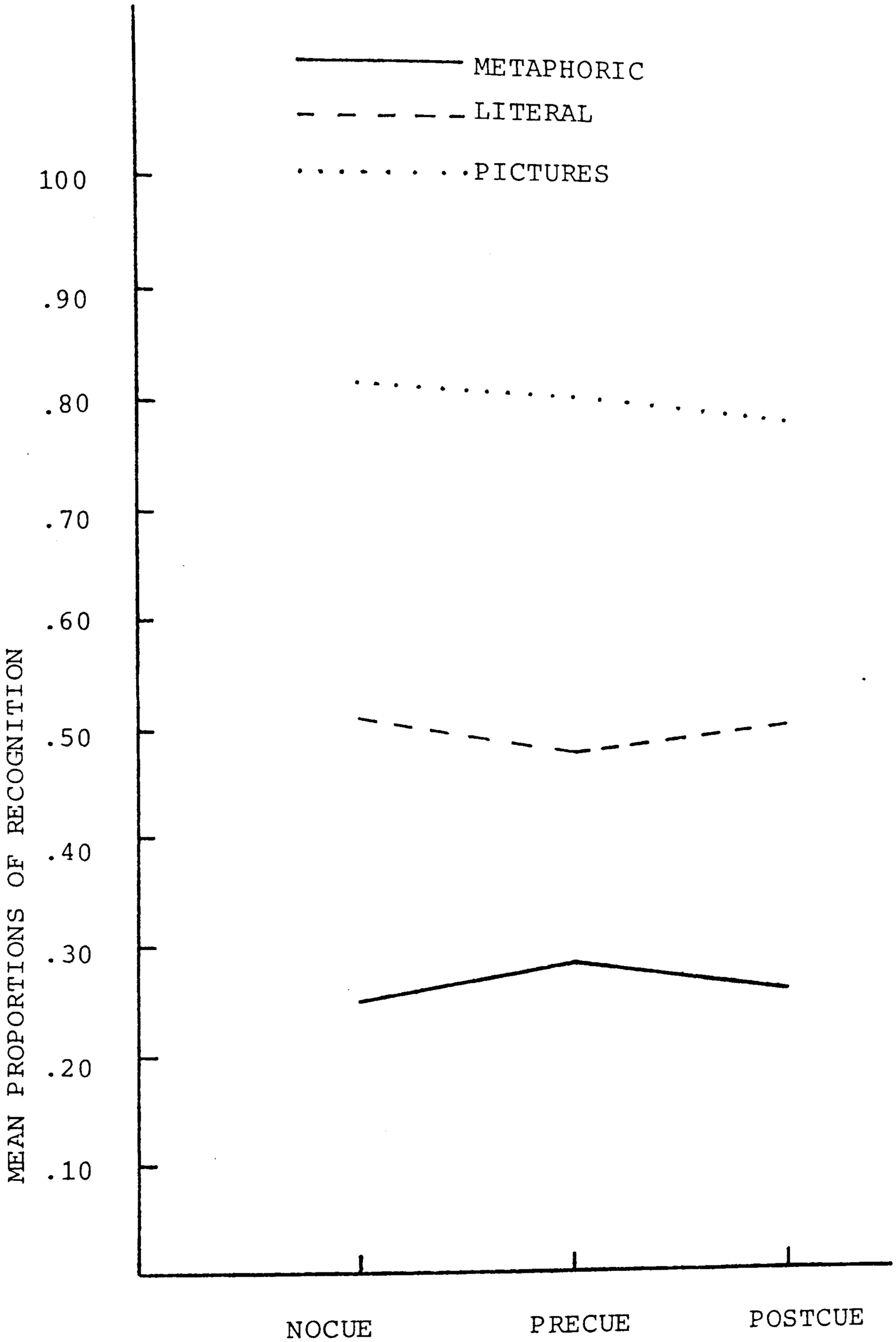


FIGURE XIX

MEAN PROPORTIONS OF SENTENCES RECOGNISED IN THEIR LITERAL AND METAPHORIC SENSE AND OF PICTURES RECOGNISED.

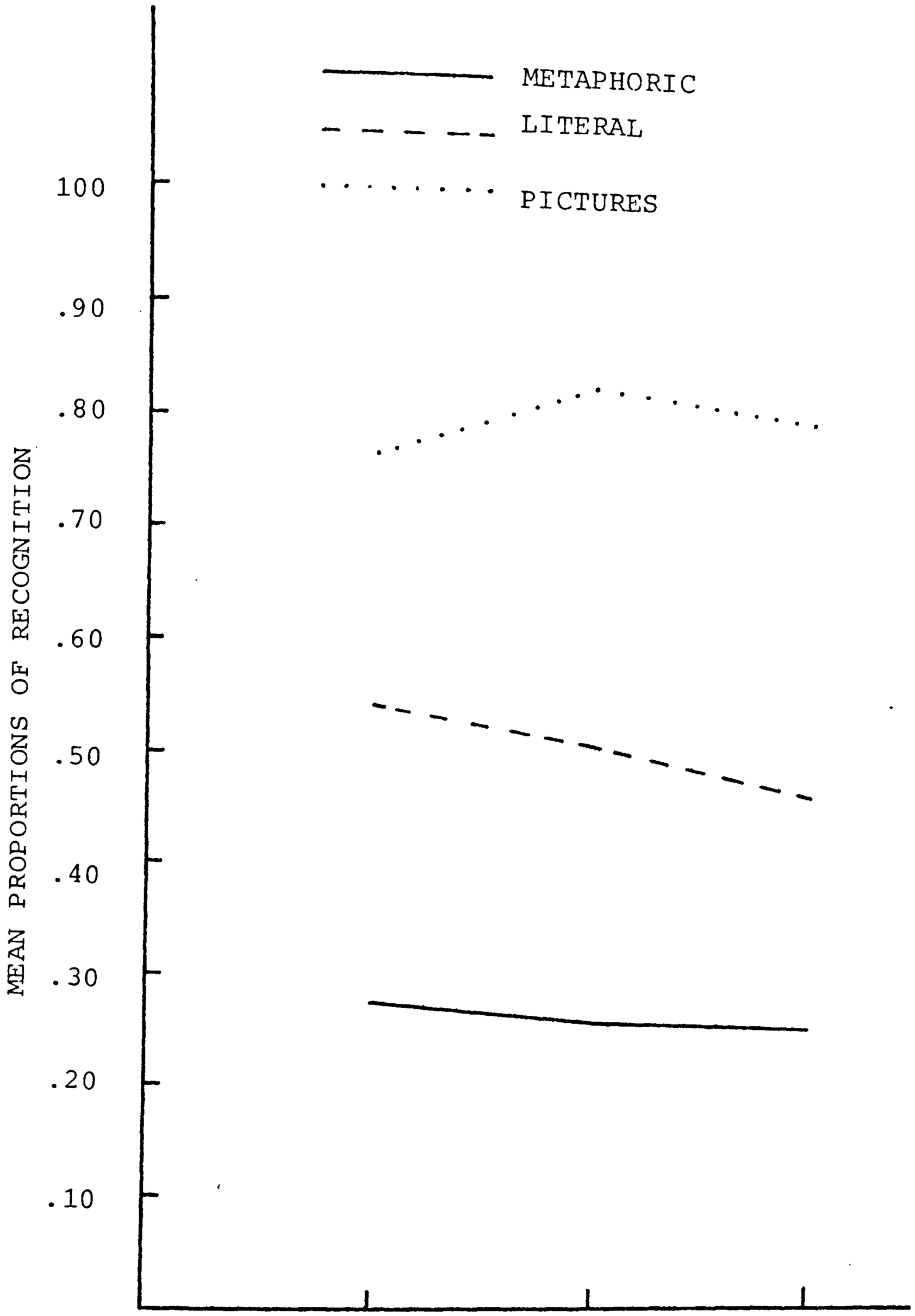


FIGURE XX

MEAN PROPORTIONS OF SENTENCES RECOGNISED IN THEIR LITERAL AND METAPHORIC SENSE AND OF PICTURES RECOGNISED

III.2.B) Test of Independence and Different Coefficients of Correlations between different materials.

This section examined a test of Independence (Chisquare), carried out between different materials, (LT, MT and P), and the degree of Dependence (Contingent Coefficient). Inspection of the data showed that the only significant result was between LT and MT, (Table L.X IV.), although the degree of dependence was low.

Coefficients of correlations were also computed. Although they were low, they were highly significant, (see also Table L X IV.).

Different comparisons between the materials were carried out, taking into account the cue. (Table L X V). The results showed that the dependence that existed between LT and MT was only at Postcue, and not very strong.

Coefficients of correlations were also calculated between materials in the function of Cue. Their data showed (see Table L X V) that the correlation between LT and MT was significant at Nocue (only Kendall's). Some of the coefficients were significant at Precue and highly significant at Postcue.

Significant correlations were not found between the other materials.

TABLE LXIV

TEST OF INDEPENDENCE AND DIFFERENT COEFFICIENTS OF CORRELATIONS BETWEEN DIFFERENT MATERIALS.

TESTS	MATERIALS		
	LT-MT	LT-P	MT-P
CHISQUARE (χ^2)	16.68**	2.01	1.49
CONTINGENT COEFFICIENT (c)	.21	.07	.06
PEARSON CORRELATION (r)	.16***	-.01	.03
SPEARMAN CORRELATION (ps)	.17****	-.02	.03
KENDALL CORRELATION (τ)	.15***	-	-

** $p < 0.01$

*** $p < 0.005$

**** $p < 0.0005$

TABLE LXV

TESTS	MATERIALS								
	LT - MT			LT - P			MT - P		
	NOCUE	PRECUE	POSTCUE	NOCUE	PRECUE	POSTCUE	NOCUE	PRECUE	POSTCUE
CHISQUARE (χ^2)	3.38	6.98	11.19*	.99	3.65	3.61	3.51	7.51	1.03
CONTINGENT COEFFICIENT (c)	.16	.23	.30	.09	.17	.17	.16	.24	.09
PEARSON CORRELATION (r)	.13	.19*	.22**	.04	.05	.03	.09	.03	.01
SPEARMAN CORRELATION (r_s)	.13	.19*	.23*	.04	.009	.05	.11	.01	.001
KENDALL CORRELATION (τ)	.12*	.17***	.21***	-	-	-	-	-	-

* $p<0.05$

** $p<0.01$

*** $p<0.005$

**** $p<0.0005$

IV) DISCUSSION.

Forgetting of sentences in their literal sense occurred over time. Subjects tested in Immediate conditions recognised better than those tested in Delayed conditions. This finding has generally been found in the memory literature (i.e. Klatzky, 1980). In relation to sentences, McKoon (1977) had subjects verify sentences related to important versus unimportant sets of ideas, either immediately after reading or twenty-five minutes later. Importance did not affect the errors in immediate recognition, but did affect the number of errors in delayed recognition. That is, important ideas were verified more accurately and faster than unimportant ideas.

In the experiment reported in this chapter, subjects recognised more sentences in the literal sense when no cue was given. Without any metaphoric cue, sentences referring to the metaphoric sense, could be considered by the subjects as unimportant ideas and, therefore they would concentrate just on those with literal meaning. This seems to be a plausible explanation for their higher performance. In fact, these subjects showed that recognition was better when the cueing context was similar to the original encoding context.

These results would support Schustack and Anderson's (1979) work. They found that when subjects were given new information that could be related by analogy to the previous one, they had a better recognition than those subjects for whom the connection between the new and the old information was either impossible or useless.

Subjects in the Precue and Postcue conditions could not

relate by analogy the ideas they read in the original text to the sentences in the literal sense. When information fits with the schema elaborated at encoding, performance should improve, while when information is incompatible with those schemata, performance would deteriorate.

Another interpretation of the failure of context provided after a story has been read is based on the principle of encoding specificity (Tulving and Thomson, 1973).

Retrieval cues are most effective when they bias the same interpretation at retrieval as they do at encoding. Subjects who did not use the title (Schustack and Anderson, 1979) or the metaphoric cue (in this experiment) to encode the passage are, therefore, unlikely to benefit from it at the time of retrieval.

Finally, Simultaneous Presentation was the best way to recognise the sentences in their literal sense. The pictures served subjects to illustrate the text, and to form the appropiate schema for subsequet performance. Presenting the pictures before or after the text impaired subjects' performance in comparison to Simultaneous Presentation.The best performance for recognising sentences in their literal sense was with Presentation Simultaneous and when no cue was given, as expected.

Differences in sentences recognised in their metaphoric sense were not found between conditions. The critical aspect of these data is the remarkable similarity in performance between Cue and Nocue conditions. Cue or Presentation variables accounted for only 38% of the variance. This pattern of results raises questions about the appropiate interpretation of the effect of context in encoding. However, it might be a floor effect for Cue and Nocue conditions where none of the subjects

recognised more than 30%. Comparing Nocue and Postcue conditions where they are mainly the same. When subjects in Nocue conditions read the sentences in their metaphoric sense, they can use the same sentences as metaphoric cues to recognise them. So, from this point of view, Nocue and Postcue were equivalent conditions. It is difficult to avoid metaphoric sentences in Nocue conditions when recognition is used.

On the other hand, it is surprising that in Precue conditions, subjects did not take advantage of the cue to recognise the sentences referred to in the metaphoric sense. The fact that the Cue variable could only account for almost 38% of the variance, could be attributed to the fact that the sample was small, but the number of subjects was three hundred and sixty, so it does not seem to be the case. Rather it might be that the recognition test was relatively insensitive in favour of the null hypothesis, that is, recognition is not a sensitive test to measure how subjects encode the text in its metaphoric sense, and that could explain why differences between the conditions were not shown.

Recognition models, (Mandler, 1972) assumed that when familiarity and/or frequency are not available as discriminative cues for recognition, additional cues are invoked. Following this, the provision of a thematic title should provide additional cues for recognition. Nevertheless, Birnbaum et al.(1980) and Alba et al. (1981) found that title manipulations did not affect recognition.

In relation to the recognition of pictures, it might be a ceiling effect between conditions. Subjects had a good performance and it was consistent among conditions. The

simplest explanation would be that the task was easy. However, when the pictures were presented before the text, (Presentation Before), subjects showed a better recognition than when the text and pictures were given at the same time. It is possible that subjects could attempt to form a schema of the scenes of the pictures before the text is presented, supporting the hypothesis that schema is formed at encoding (Bransford, 1979).

Even with the best performance at Presentation Before, there were some differences according to the moment when the cue was given, the greatest rate of forgetting being at Postcue, i.e. when the cue was given at recognition, and they were tested with a delay. If the metaphoric cue interfered with subsequent pictorial information, this would affect the subjects' performance. Mandler and her associates (i.e. Mandler and Johnson, 1976) have postulated that subjects form scene schema when pictures alone are presented to them. If there is a mismatch between subjects' elaborations of the pictures (scene schemata) and the metaphoric cue at retrieval, their performance should deteriorate since the loss of the original pictorial information would not allow them to reorganize these schemata. If that was the case, schema would be formed at encoding.

This finding would support the encoding specificity hypothesis (Tulving and Thompson, 1973) in the sense that subjects who had not had the metaphoric cue to encode the pictures then drew from it at the time of retrieval.

But, the most striking result in relation to the recognition of pictures was the fact that very little forgetting occurred over the retention interval. Although it

has been found that memory performance declined over time, there are nevertheless some exceptions. For example, Bower et al. (1975) presented uninterpretable drawings with amusing meanings, (droodles), while subjects were either provided with labels that clarified these meanings or were given no labels. After a retention interval of a week, recognition performance was very good and no differences between the two groups were found.

When the recognition of the three materials was compared pictorial recognition was superior to verbal both in its literal and metaphoric sense in all Presentation and Cue levels. This finding contradicts what was found for recall in the previous chapter where verbal material in its literal sense was superior to pictures in a Simultaneous Presentation when no cue was given. It might be that the pictorial recognition task was very easy to perform and so, not comparable to the verbal tasks.

Taking into consideration verbal recognition tasks, recognition of sentences in their literal sense was always higher than in their metaphoric sense in all Presentation and Cue levels. This trend of results was found in the recall task as well where literal was always superior.

When independence of different materials were tested, recognition of pictures and verbal material were found to be independent, but there was some dependence between the verbal ones, that is, recognition of sentences in their literal and metaphoric sense, although the degree of this was not very strong. Postcue conditions were causing this dependence.

It has to be pointed out that the factors which affect the relative ease of a recognition task are, among others, the size of the distractors set and the similarity of these distractors to target items (Brown, 1976). In the pictorial recognition task, it might be that the number of the distractors was not big enough and/or they were not similar enough to the target photographs and, therefore the constructed task was not difficult enough to discriminate between conditions.

A critical aspect of the experiment reported in this chapter, and a critizable one as well, is the recognition test itself. Research on recognition have used an identical material to the one used in the learning task. However, most of these experiments dealt with lists of words,digits,or even sentences. When subjects are asked to recognize a text it has to be decided whether the analysis unit should be the ideas expressed throught the text (even if expressed by paraphrases) or identical sentences extrapolated from it. This is a crucial decision in order to construct the sentences to be used as distractors. The approach taken in this experiment was to evaluate idea units rather than identical sentences,following Bransford and Johnson's own approach to evaluate the recall of a text.

Obviously, by desighning such a recognition test, the scope of comparisons to traditional recognition tasks has been limited, but this was accepted as a consequence of a fair evaluation of text processing.

Therefore, the recognition test being used in this experiment might have some resemblance to what is known in the literature as " cued recall tasks".

The difficulties of designing a recognition test for prose increases drastically when metaphoric sense of a text was involved. In fact, it seems almost impossible to construct a set of distractors for sentences whose meaning (i.e. metaphorical) might not reach the subjects at all. If that were the case (and it is impossible to know if subjects have understood the metaphorical meaning before analyses of their recall protocols have been made), metaphorical distractors would be in fact no different from literal distractors sentences.

A clear consequence of this design, and of the difficulties involved in constructing a prose recognition test, will be a logical difference between pictorial and verbal tasks. This difference might have an influence on the clear superiority of subjects' performances in recognising pictures as compared to both literal and metaphorical prose.

CHAPTER V.

RECALL VERSUS RECOGNITION OF TEXT IN ITS LITERAL OR METAPHORIC SENSE AND OF PICTURES.

I) INTRODUCTION.

During the last decade, there has been a long debate in memory research on whether recall and recognition tasks involve the same or substantially different operations (see Brown, 1976). One possibility is that performance's differences for recall and recognition are based on their corresponding memory trace strength. This theory (threshold hypothesis) assumes that both recall and recognition performance depend upon the strength of items in long-term memory. An item must have a certain amount of strength before it is recognised or recalled. The threshold of recall is assumed to be higher than the threshold for recognition. The need for a lower memory strength would mean a superior recognition performance. But a "less memory strength" might mean either a generally weaker trace or a more partial one, e.g. retention of a simple attribute of material might be enough for a successful recognition.

Another possibility is that recall would be harder than recognition because of differences in their underlying processes. Recall would include the processes of search (following pathways in long-term memory and finding items) and decision (deciding whether or not those items are appropriate to report). This theory (dual-processes)

proposes these two processes for recall and suggests that recognition corresponds to the decision process only.

However, recent data (Mandler, 1979, 1980) have shown that organised retrieval processes which operate recall are executed to some extent at recognition. The organization of the material to-be-remembered varies in two dimensions: the integrative dimension, which refers to intrastructural integration, and the elaboration dimension, which refers to interstructural organization. As Mandler has suggested:

> " Structural integration refers to such phenomena as (increasing) structural invariance and structural compactness...the successful repetition of a particular structure contributes to its increasing integration... Repetition is a major function variable in such integration and "recognition" its most visible product". (Mandler, 1979, p.297).

On the other hand Mandler refers to structural elaboration as the degree to which an item or a structure,

> "...are part of another more general structural system...or the degree to which at the time of encoding...they are parts of a structural network connecting them to other structures that may be coordinate, subordinate, or superordinate... (Individuals process and elaborate) the to-be-remembered unit in terms of varying degrees of some intrastructural relation...
> The more embedding of the target unit in other structures and the more relation exist to other structures, the more complex and elaborat is the organizational encoding of the unit".
> (Mandler, 1979, pp. 299-308).

For Mandler any memory task requires both integration and elaboration.Both recall and recognition tasks involve retrieval processes that have been considered to be recognition and recall processes. But the distinction,for Mandler, is a remnant of common-language usage so that, it would be difficult

to find a useful psychological distinction for those tasks which are at the boundary of both processes. In other words, recognition and recall tasks involve information from both organizational dimensions (integration and elaboration).

As Mandler has explicitly said:

> " For any particular task, the balance between the two (processes) will favor one or the other dimension. Thus recognition tasks frequently but not by no means always draw heavily on the integrative dimension". (Mandler, 1979, p.308).

From his perspective it would be crucial to avoid the error, so frequent in psychology, of identifying a particular class of tasks with specific psychological processes.

The search for differences between recall and recognition is based in the fact that recognition is generally easier than recall. Things that cannot be recalled can be recognised (i.e. tip-of-the-tongue phenomenon). However, Flexser and Tulving (1978) have recently shown that response items that can be recalled are recognised very little better than those that cannot be recalled in a paired-associate situation.

These data raise problems in explanations of recall and recognition differences due to their corresponding strength (i.e. less trace strength needed for recognition than for recall) or to component processes (i.e. a memory search is needed for recall, but it might not always be necessary for recognition).

Although recall and recognition processes are not fully understood, it may be that both involve similar processes but different types of information. As many authors (Craik, 1979; Flexser and Tulving, 1978) have suggested, recall could involve the retrieval of a stimulus trace given a specific context while recognition imposes the retrieval of an earlier context given a specific stimulus.

The research on the differences between recall and recognition have mainly used lists of words or sentences, and there is still very little evidence of these differences when a text is employed as the material situation.

The present chapter examines the differences between recall and recognition with the three types of materials, that is, recall versus recognition of text in its literal and metaphoric sense and of pictures.

Studies comparing recall and recognition have used within -designs, where subjects learned some material and were tested subsequently on it by a recall and a recognition test . To assess differential effects between recall and recognition these within-desi gns might be adequate, because then both types of memory are tested on the same subjects and with the same material. However, as Brown (1976) has shown, recall does affect subsequent recognition performances. Therefore it would be difficult to disentagle the specific performance of each type of process. In this case, it will be wisely to use a between-subjects desing.

In this chapter the data reported in the two previous ones are compared and, consequently the subjects' performances in the recall task are compared with those of a <u>different</u> group of subjects in the recognition task.

II. RESULTS.

This chapter compares recall versus recognition of text in its literal sense, in its metaphoric sense, and of pictures. A qualitative analysis will be carried out for each material in the following three sections with a reference to the main significant factors and the interactions that have been found in the previous analyses.

II.A. Recall versus Recognition of text in its literal sense (LT).

As illustrated in Figures XXI,XXII and XXIII recognition performance was higher than recall performance throughout all Presentation, Cue, and Testtime conditions.

Both recall and recognition performances declined over time for all Nocue conditions (see Figure XXI) .

A similar decrease in performance was observed over time in Precue conditions for recall tasks with Simultaneous presentation, and for recognition tasks with presentation Before (see Figure XXII). In all the other Precue conditions both recall and recognition performances showed no decrement over time (see Figure XXIII).

On the whole, by combining the information plotted in Figures XXI,XXII, and XXIII, Simultaneous presentation allowed higher performances than presentations either Before or After. Presentation Before showed a higher perfpr-mance than presentation After.

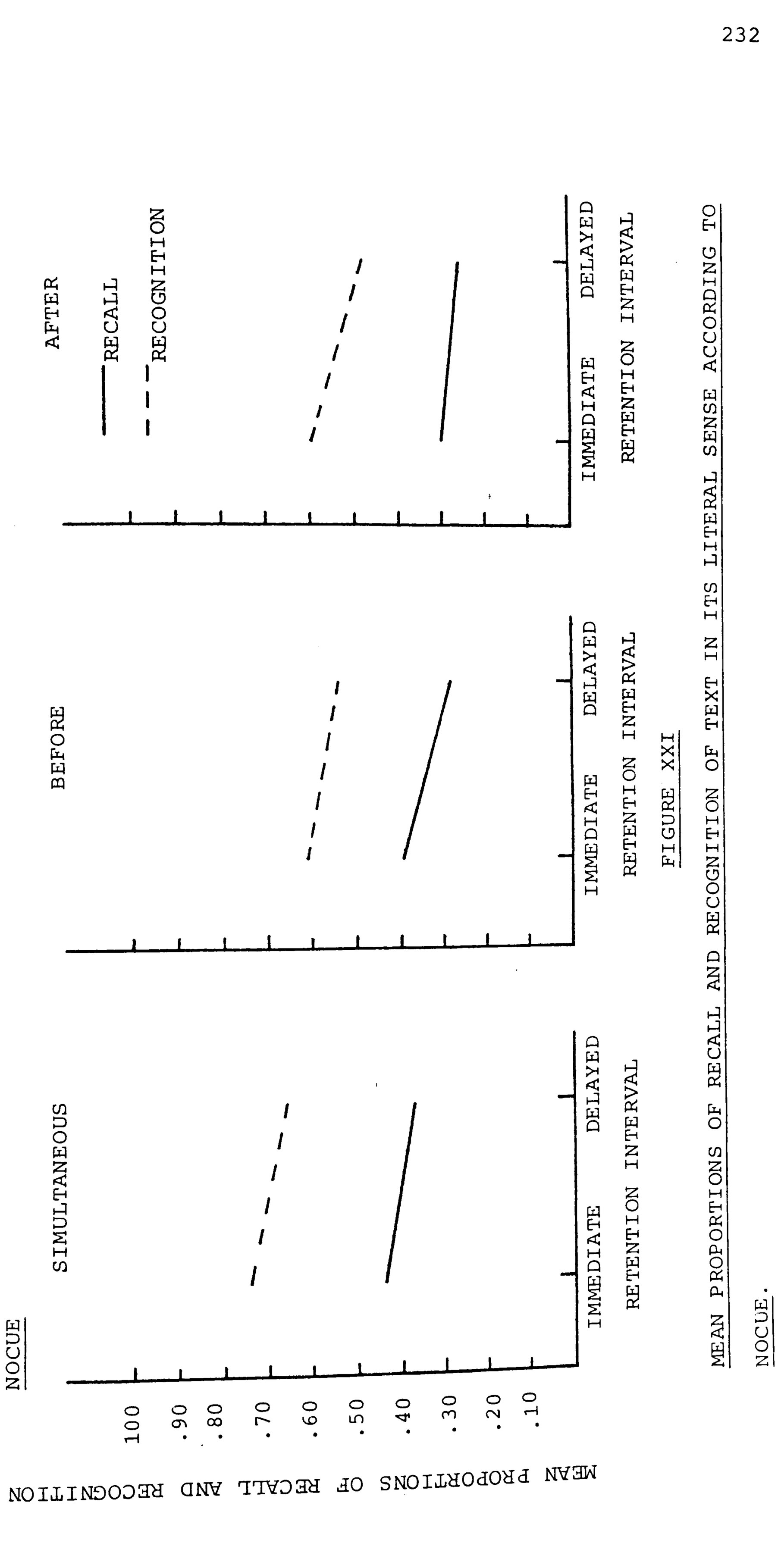


FIGURE XXI

MEAN PROPORTIONS OF RECALL AND RECOGNITION OF TEXT IN ITS LITERAL SENSE ACCORDING TO NOCUE.

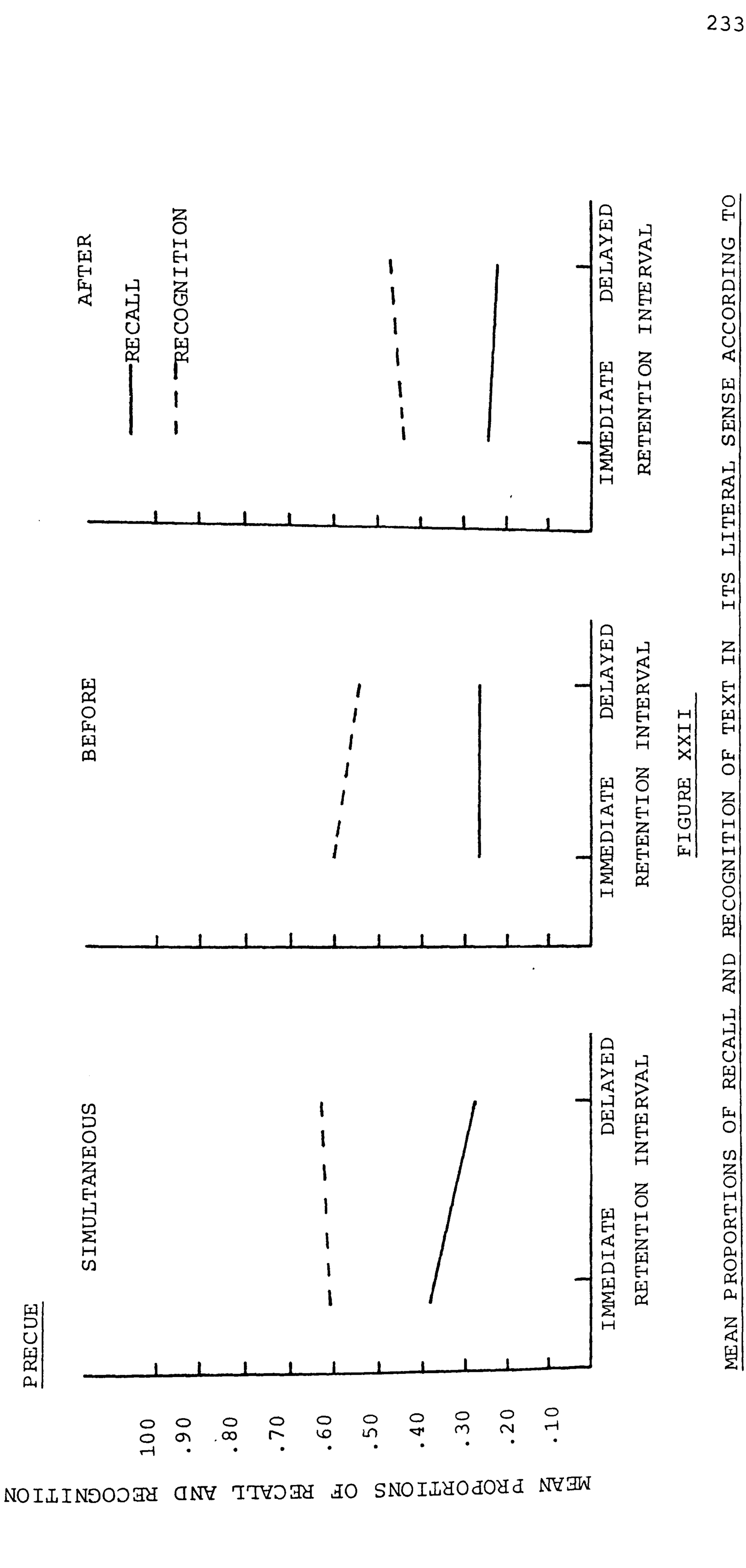


FIGURE XXII

MEAN PROPORTIONS OF RECALL AND RECOGNITION OF TEXT IN ITS LITERAL SENSE ACCORDING TO PRECUE.

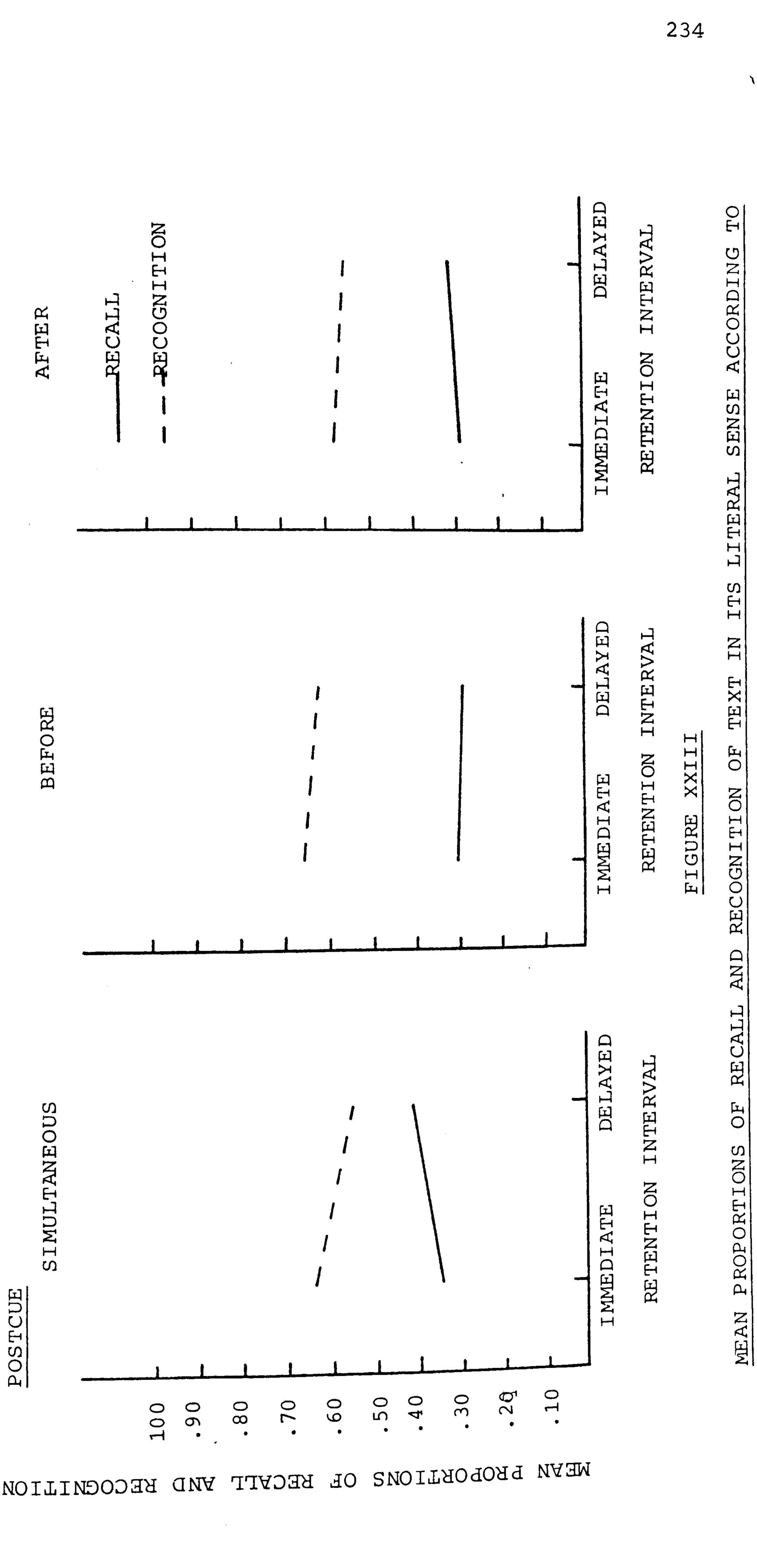


FIGURE XXIII

MEAN PROPORTIONS OF RECALL AND RECOGNITION OF TEXT IN ITS LITERAL SENSE ACCORDING TO POSTCUE.

Looking at the between-subjects analyses for recall performances it has been shown that both Nocue and Precue conditions have declined over time (see p.99), but no significant interaction was found between Testtime and Cue for recognition performances (see p. 192).

However, a significant interaction appeared between Cue and Presentation in recognition tasks (see p. 193) while the same interaction did not influence the results in recall tasks.

II.B. Recall versus Recognition of text in its Metaphoric sense (MT).

The results are plotted in Figures XXIV,XXV, and XXVI.

For Nocue conditions recognition performances were obviously higher than recall performances as the later showed no retention at all (see Figure XXIV).

In Simultaneous Precue conditions, Figures XXV illustrates that recognition performances were higher than recall when subjects were tested immediately. But, while recognition declined smoothly at delayed tests, recall performances recovered over time for the same tests.

With a Simultaneous presentation and Cue given at recall or at recognition (Postcue condition, see Figure XXVI), the- phenomenon is exactly the opposite. Recall clearly deteriorates over time so that, the biggest difference between recall and recognition appeared at Delayed conditions (see Figure XXVI).

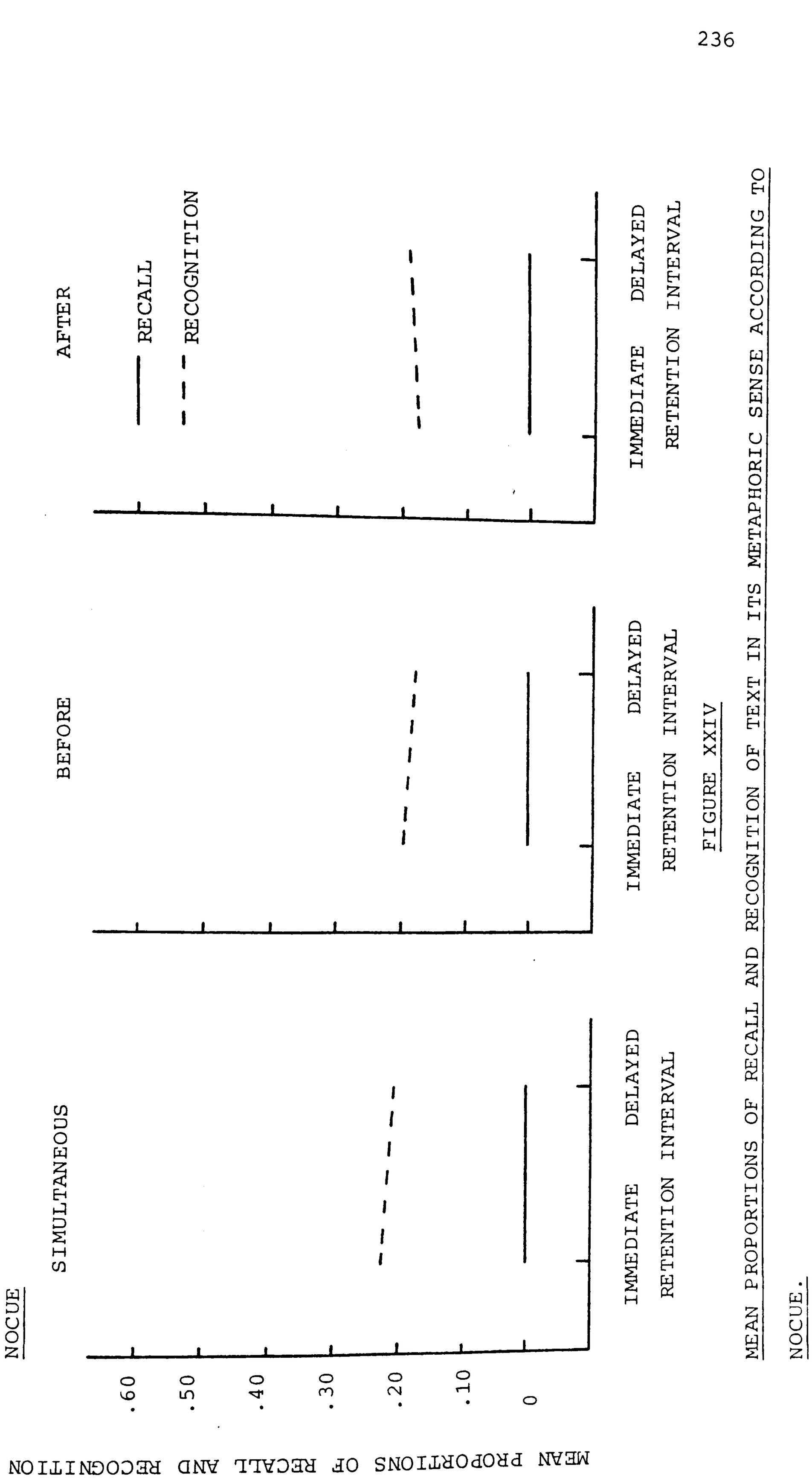


FIGURE XXIV

MEAN PROPORTIONS OF RECALL AND RECOGNITION OF TEXT IN ITS METAPHORIC SENSE ACCORDING TO NOCUE.

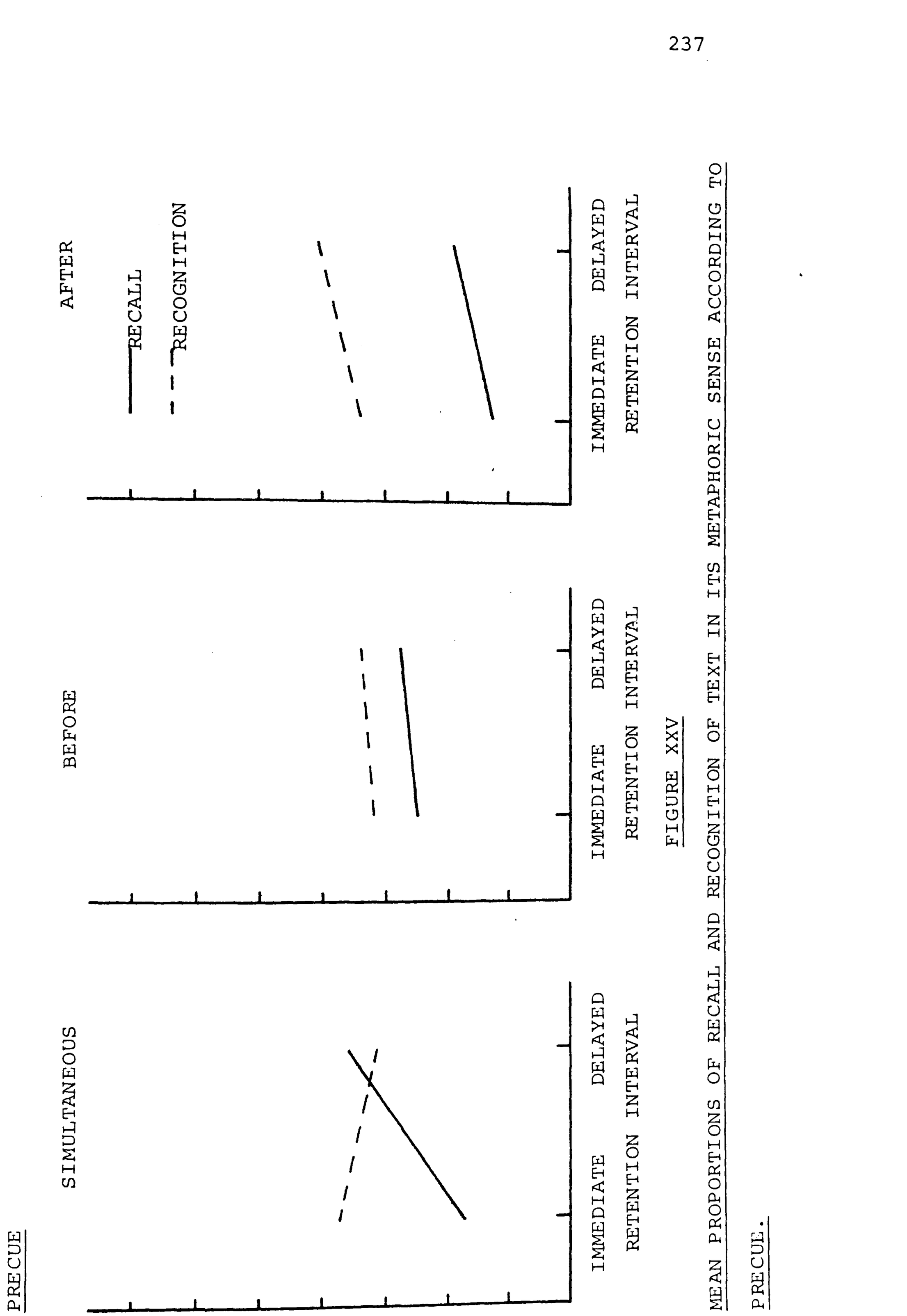


FIGURE XXV MEAN PROPORTIONS OF RECALL AND RECOGNITION OF TEXT IN ITS METAPHORIC SENSE ACCORDING TO PRECUE.

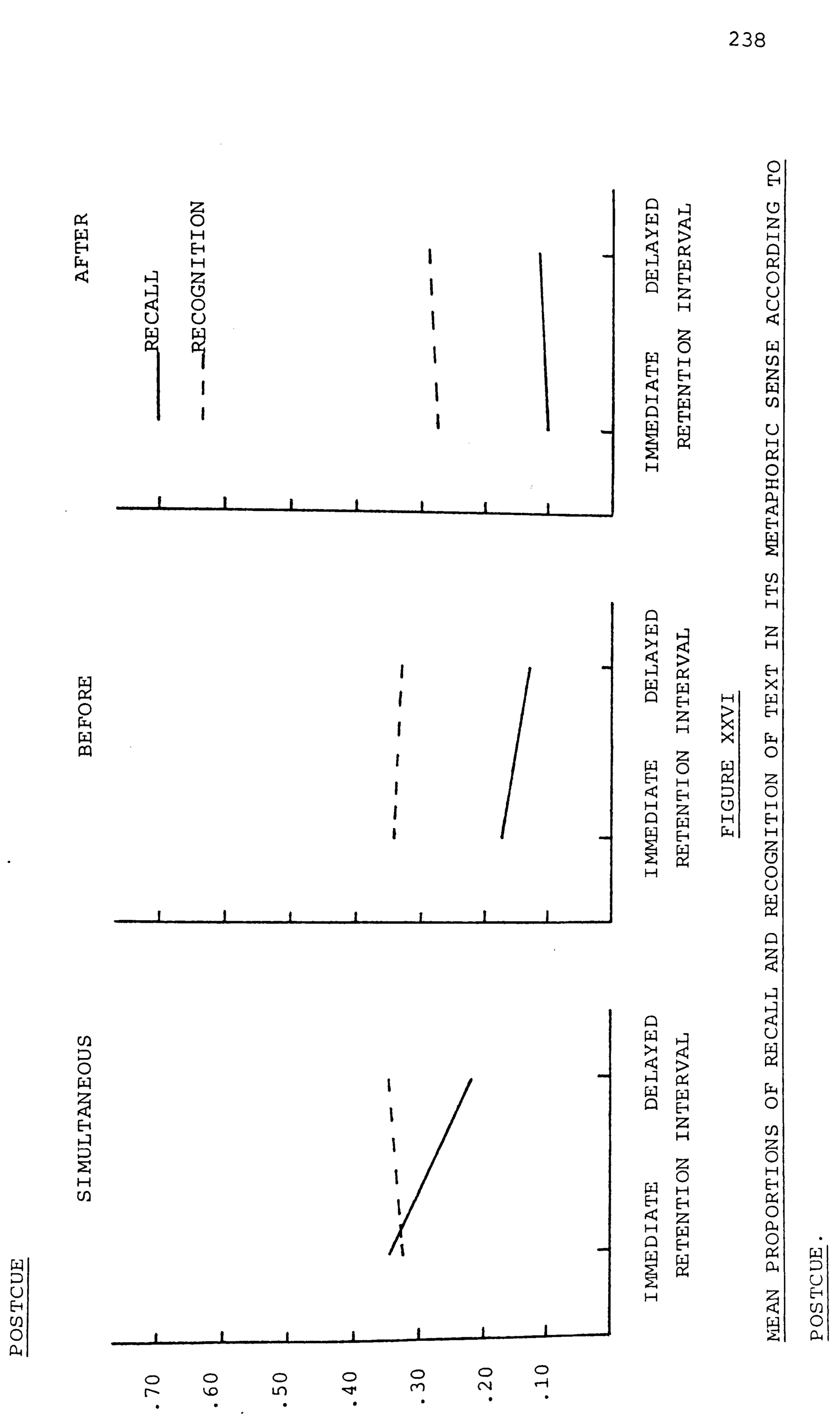


FIGURE XXVI

MEAN PROPORTIONS OF RECALL AND RECOGNITION OF TEXT IN ITS METAPHORIC SENSE ACCORDING TO POSTCUE.

Recognition performances for all presentations Before and After were higher than recall performances throughout all Cue and Testtime conditions (Figures XXIV,XXV and XXVI).

However, when looking at the between-subjects analyses, recognition results did not have any significant interaction nor the main factors were significant either.(see Table LVII p. 202). On the other hand, the between-subjects analyses for recall performances showed that both the triple interactions and Cue x Testime and Presentation x Cue interactions were significant (see Figures IX and X, p. 118).

II.C. Recall versus Recognition of Pictures (P).

The results are plotted in Figures XXVII,XXVIII and XXIX.

Presentation Before in Nocue (see Figure XXVII) and in Precue (see Figure XXVIII) conditions improved recognition performances over time, qhile recall performances deteriorated over the retention interval.

When the cue was given at recall or at recagnition (Postcue condition, see Figure XXIX), both recall and recognition performances declined over time. However, the slope was steeper for recall than for recognition.

Throughout all conditions, recognition performances were better than recall regardless whether subjects were tested immediately or with a delayed interval.

In Simultaneous Delayed conditions, recognition deteriorated from Nocue to Precue, and improved from Precue to Postcue. On the other hand, performances for recall remained the same from Nocue to Precue, and deteriorated from Precue to Postcue.

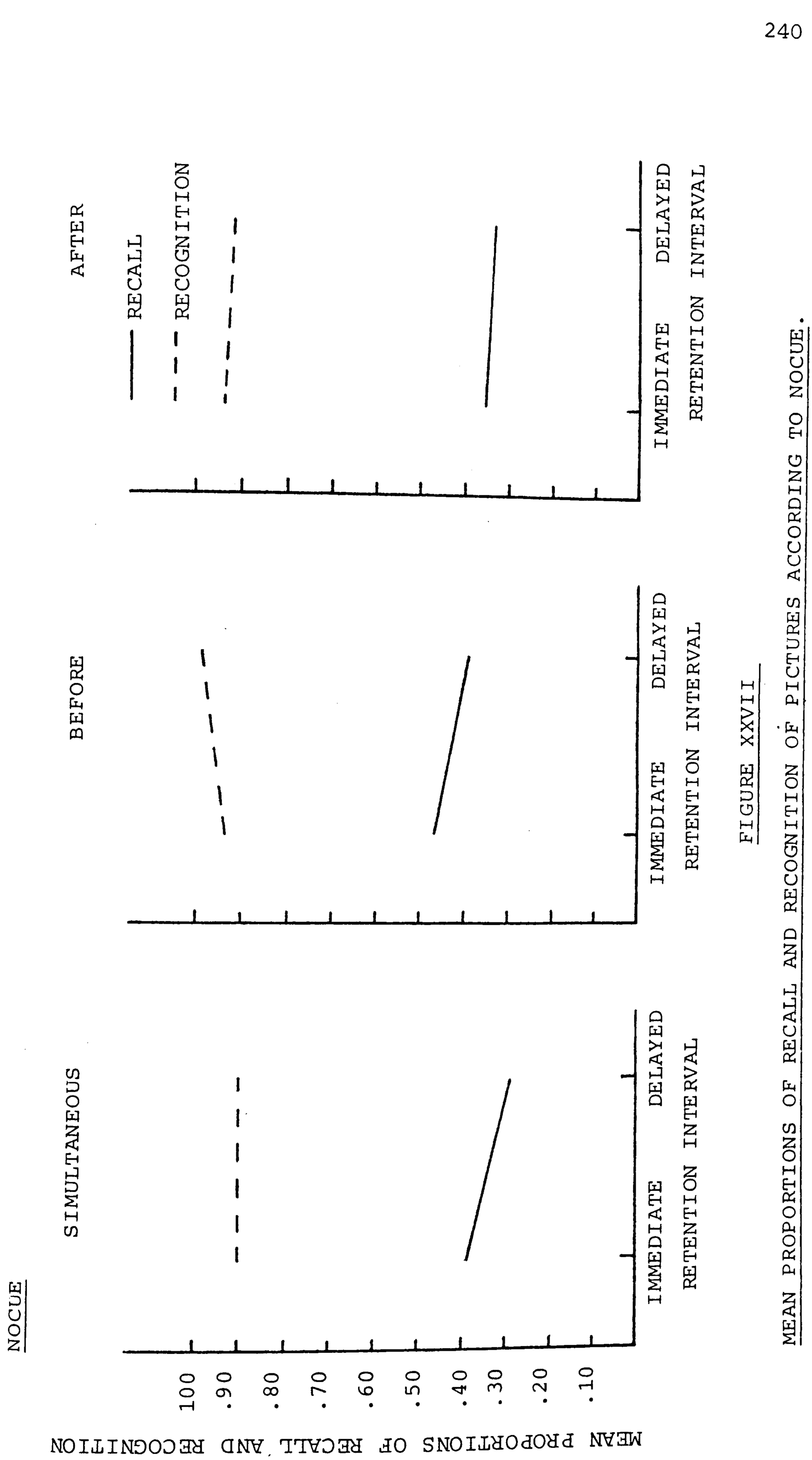


FIGURE XXVII

MEAN PROPORTIONS OF RECALL AND RECOGNITION OF PICTURES ACCORDING TO NOCUE.

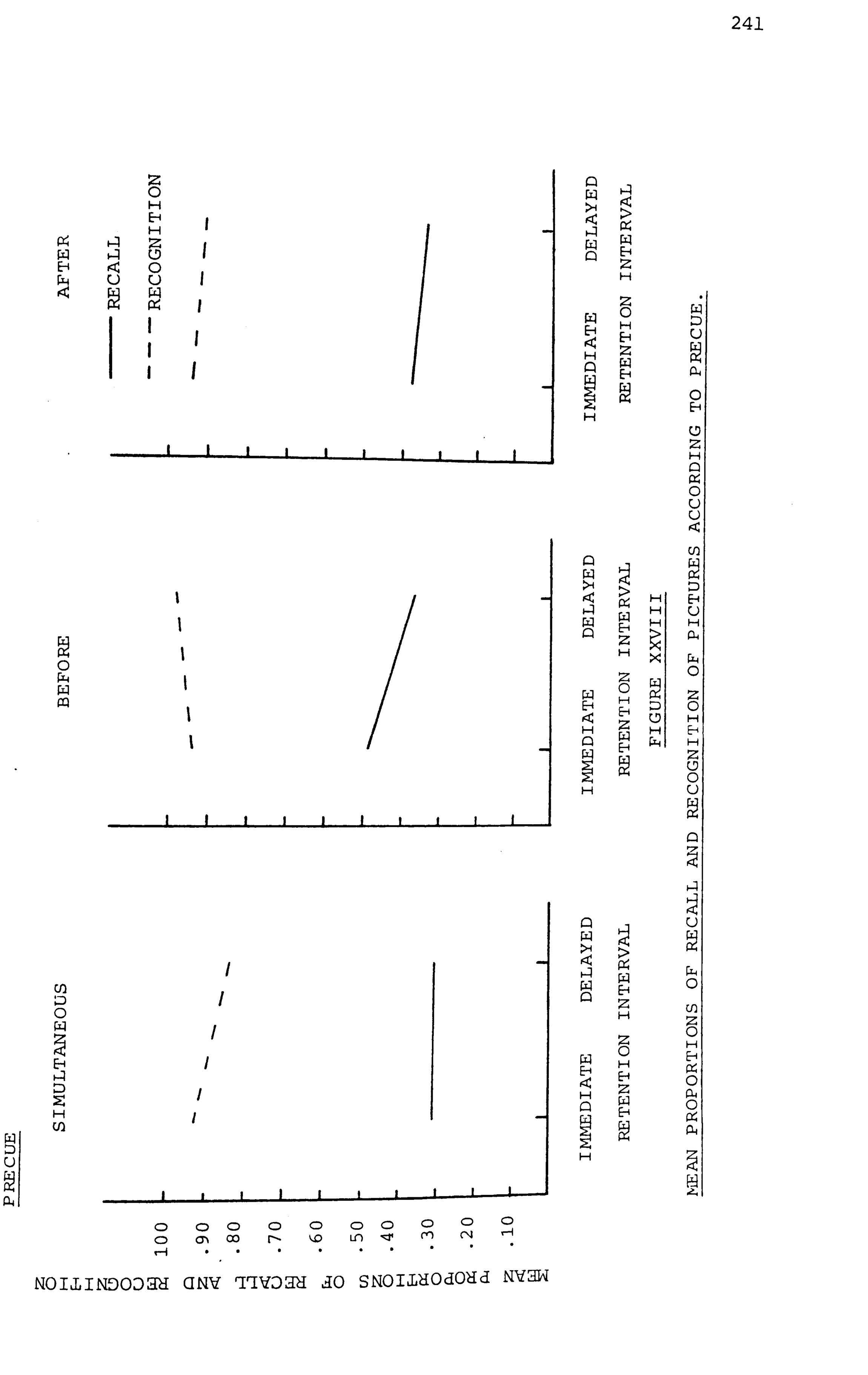


FIGURE XXVIII

MEAN PROPORTIONS OF PICTURES ACCORDING TO PRECUE.

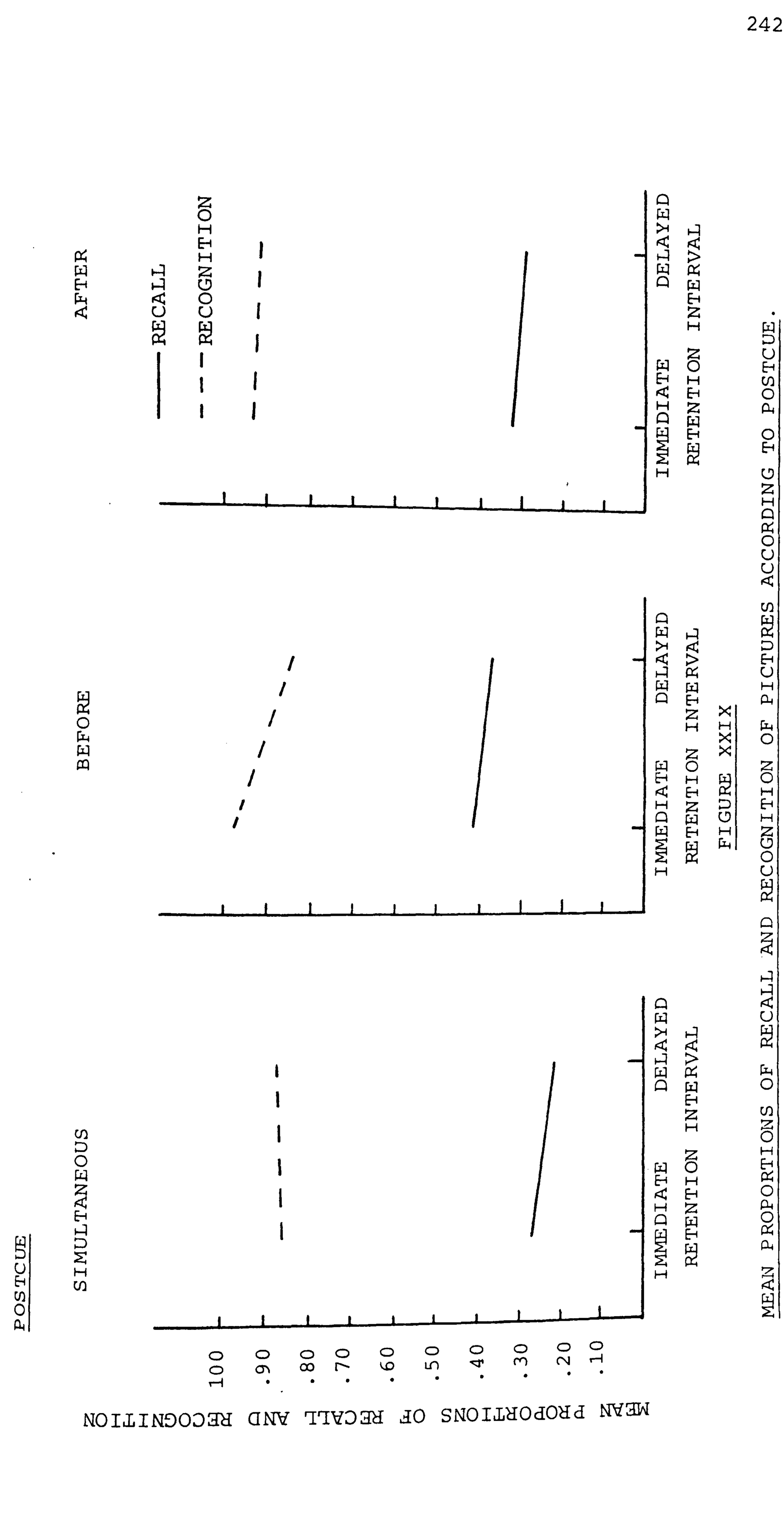


FIGURE XXIX

MEAN PROPORTIONS OF RECALL AND RECOGNITION OF PICTURES ACCORDING TO POSTCUE.

At Before Delayed conditions, recognition remained the same from Nocue to Precue and deteriorated from Precue to Postcue. On the contrary, recall performances remained the same at Nocue, Precue and Postcue conditions.

However, the between-subjects analyses carried out in previous chapters showed that, for recognition performances, the triple interaction was significant (see p. 217), while in recall performances it was not. For the later, the only significant effects were found for the three main factors (see p. 131).

The most common feature for both recall and recognition of pictures would be that presentation Before is the most effective in either task.

III) DISCUSSION.

In relation to text in its literal sense, recognition was always better than recall in all of the Presentation and Cue levels. (*)

Mandler (1979) has recently suggested two dimensions of organization: intraitem and interitem processing. The former would serve an integrative function, that is, it would make items more discriminable from other encoded items, and therefore recognition memory would be more effective. The latter, interitem processing would serve an elaboration function, so that associate interconnections between target item and other information would be possible. In this way, recall performance would be benefited by this interitem organization. Mandler (1980) suggested that recognition memory is based on two processes: familiarity and retrieval of context. In his model familiarity depends on the intraitem integration. Subjects' judgements of familiarity are very automatic depending on how similar test items are to encoded items. According to Mandler, when test familiarity is not so clear for making a decision, the second process - retrieval of context - is taken into account. So, recognition performance will depend not only on the contextual information already encoded but also on the difficulty with which the item can reintegrate that information at test.

The interpretation of the superiority of recognition over recall in text in its literal sense can be explained in terms of intraitem organization as suggested by Mandler (1979,1980). When subjects saw the literal sentences in the recognition

(*) It has to be reminded the differences between both tasks and the difficulties in constructing a valid recognition test for prose as it was discussed in pp. 224 and 225.

task, they were familiar with the ideas of the text already encoded, and they were able to integrate them with a subsequently good performance. Recognition was best with Presentation Simultaneous, and when no metaphoric cue was given.

In relation to text in its metaphoric sense, the superiority of recognition over recall disappears in those conditions where a strong elaboration seems to be made by the subjects, that is, Simultaneous Presentation Precue Delayed and Simultaneous Presentation Postcue Immediate. In Simultaneous Precue Immediate, subjects were given the metaphoric cue before they read the text. According to Mandler, subjects have to make interitem organization so that associative interconnections between the ideas of the text and the information given by the cue could be possible. With this kind of processing, they are able to elaborate the material and to show a better performance in recall than in recognition.

In Simultaneous Presentation Postcue Immediate the same effect is found. Its only difference from the previous condition is that the metaphoric cue is given at recall or at recognition. When the cue is given at recall, subjects are able to re-elaborate the information already encoded with the new information, the cue, showing a better performance than in recognition.

When no metaphoric cue was given, subjects were not able to comprehend any metaphoric sense, as was predicted in the recall task. But in recognition, the sentences which referred to the metaphoric sense were presented to the sub-

jects, and they could then serve as a cue regardless of the fact that the metaphoric information was not given before or after they had read the text. In this way, recognition task might provide subjects with a "covert" metaphoric cue that recall task did not, and this difference would be shown in their corresponding performances.

Although the schema theory has not explained the processes involved in recall and recognition, it might fit in with Mandler's explanation. When subjects made interitem organization they should make associations between the items presented to them (elaboration dimension) and their stored knwoledge. This knowledge would activate their appropriate schemata already constructed.

Mandler's suggestion has been based mainly on lists of words but not on texts. It would be interesting to test his more recent theory with this kind of material.

Mandler's distinction between interitem and intraitem organization could be related to Norman and Bobrow's (1975) data-driven versus conceptually-driven processing in perception. For them, there are two different modes of activating schemata: data-driven or bottom-up, and conceptually-driven or top-down activation. The former implies that a schema in memory becomes activated because of pattern recognition analyses carried out on events from the environment. The conceptually-driven processing implies that a schema can also be activated through other schemata or from the top-down. In other words,a given schema could be activated by either an instruction or by other related schemata. In neither case is the schema being directly activated from

an item being perceived but,rather it is activated by the context of the item presented.

Intraitem organization would imply both kinds of processing (data-driven and conceptually-driven) while interitem organization would only imply the conceptually-driven processing. If this is the case, recall would involve only conceptually-driven processing and recognition both data-driven and conceptually-driven processing.

In relation to pictures, recognition was always superior to recall in all of the Presentation and Cue conditions. (*) Although Mandler's theory has not been postulated for pictorial information, it can be suggested that intraitem integration would be possible with this kind of material as well. In the pictorial recognition task reported in this thesis, subjects had a very high performance. The simplest explanation would be that the task was easy. In fact, subjects learned the material well and the distractors did not seem to be disimilar enough to hide the target items. So, when subjects saw the pictures in the recognition task they found them very familiar and they could easily judge that they have seen them in the learning task and, therefore integration was easily achieved.

On the contrary, in the recall task subjects were asked to remember details of the pictures. In order to do this they had to make elaborations of them and to express pictorial information verbally, an additional load in itself.

(*) However it should be reminded that recognition task for pictures seems to be easier than recall task.

CHAPTER VI.

CONCLUSIONS.

I) THE ROLE OF CONTEXT IN PROSE AND PICTURES PROCESSING.

The main concern of this thesis was to examine the role of context in prose processing. Context has been manipulated in two different ways: first, by a pictorial setting presented either simultaneously,before or after the text, or not presented at all; secondly, by the presence or absence of a metaphoric cue provided either at encoding or retrieval which would allow subjects to process the text in a non-literal sense.

As a by-product of this design, some information was gathered about pictures processing and about the role that a text might play as context for the pictorial setting.

It has been found in Chapters II,III and IV that context does play an important role in both literal and metaphoric prose processing.

In Chapter II an extension of Bransford and Johnson's (1972) experiment was reported in which context was manipulated only by pictorial setting. It was found that when the subjects did not have the appropriate context they were less able to comprehend and recall the passage. These results supported the view of constructive approach (Bransford and associates) that there is always an interaction between the reader's knowledge and the text.

However, an exception to this general rule of appropria-

te context was found in the experiment reported in that chapter. When subjects were tested immediately after they have heard the text twice without the appropriate context, they were even able to remember verbatim sentences of the text. However, when they were tested with a delay of 24 hours, recall declined showing that it was really verbatim without much elaboration of the material.

In Chapters III and IV context was manipulated in the same way, i.e. by using a pictorial setting. The texts used in this thesis as the experimental material were similar inasmuch as they were "descriptive". But they differed from each other in that the text in the "Balloon study" (Chapter II) was incomprehensible without the pictures but this did not prevent the subjects from remembering it (text repeated twice without context and immediate test). While the text published in the daily newspaper "El Alcazar" (Chapters III and IV) was comprehensible by itself without the pictures. Nevertheless, this pictorial setting did help subjects to recall the text both in its literal and in the metaphoric sense.

One possible way to account for these differences would be the "difficulty" of the texts. However, it would be possible to understand this dimension in at least two levels: first, piece meal linguistic difficulty (i.e. less familiar words used to describe sportive events in the newspaper text) would be greater in the "El Alcazar" text; secondly, difficulty of literal comprehensibility which definitely would be greater for the "Balloon" text.

It would be important to examine to what extent the contexts of these experiments are the same or different for each material.

In the "Balloon" text (Chapter II) the appropriate context was found to be either when the pictures were presented before the text (Context Before) or when they were given simultaneously with it (Context Simultaneous), and in both conditions subjects were tested immediately. Although subjects' ideas recalled were better in Simultaneous Presentation, this did not differ statistically from Context Before. The conclusion would be that simultaneous presentation of pictures did not provide a better illustration of the text than when they were presented in anticipation of it.

On the contrary, when the text came from the daily newspaper (Chapters III and IV), and it had to be processed in its literal sense, subjects had a better performance either in recall or recognition when it was presented simultaneously with the pictures, rather than when the pictures were presented before or after the text. Therefore, the kind of material seems to have an effect on the amount of illustration that pictures provided.

The section and the page where both text and pictures appeared originally, plus the well-known extreme right-wing ideollogy of the Spanish newspaper, provided the natural context for the metaphoric sense in which it could be processed. Deletion of these critical cues was used to"construct" the literal context for the same material. The most appropriate context to recall the newspaper text in its metaphoric

sense is also its simultaneous presentation with the pictures (Chapter III).

However, taking into account the manipulation of the two contexts, i.e. metaphoric versus literal context, and pictorial setting, it is possible to specify more precisely the effect of context. For literal prose, Simultaneous Presentation combined with Nocue conditions allowed the highest performance for both recall and recognition. For metaphoric prose, the same presentation provided the most appropriate context. However, its combination with the metaphoric context did not show a linear result. Giving metaphoric cues either at encoding or at retrieval did affect subjects' recall performance depending on when they were tested. A significant interaction was found between Testtime and Cue presentation.

So, it seems that to recall the newspaper text (Chapters III and IV) the whole context , i.e. pictorial plus metaphoric context, has to be available. These results would also support the constructive approach because subjects showed "the effort after meaning", i.e. they constructed their recall in function of their previous knowledge (communication, sportive events, political situation,etc...).

With regard to pictures the appropriate context was different. The optimum context for recalling or recognising them was when pictures were presented on their own before the text (Chapters III and IV). It looks as if the text, either presented after the pictures (Presentation After) or simultaneously with them (Simultaneous Presentation), interfered with subjects' subsequent pictorial retention.

Subjects seemed to elaborate, or to integrate, the information about the pictures in order to recall details of them or recognize them (Chapter V).

The results of all these experiments reveal a striking dual-asymmetry. On the one hand, the "Ballon study" presenting the pictures before or simultaneously with the text did not make a significant difference in subjects' recall. While presenting the pictures simultaneously with the newspaper text allowed subjects to show their highest performance. On the other hand, to recall verbal material from the newspaper text, a simultaneous presentation of both text and pictures provided subjects' best recall.While to remember pictorial material, pictures were better recalled or recognised when they were presented before rather than simultaneously or after the text.

In relation to verbal and pictorial processing, it is proposed that none of the present models fully accounted for these results. Consequently, it is suggested that future models might take into consideration a two-stage processing. At its first level, both verbal and pictorial information would be processed although independently. At its highest level, an abstract encoding neither pictorial nor verbal would provide the possibility of a transfer of information from one mode to another. This model could account for the fact that details of the pictures were encoded visually,and so lately recognised, while their recall did take a verbal expression.This expression would be the result of a high-level abstract encoding. On the other hand, higher performances in both recall and recogni-

tion of pictures, presented before the text, would be a consequence of the specifically visual low-level encoding system.

To conclude, context does play an important role in both comprehending and remembering prose, and varies from one situation to another.

II) THE PROCESS OF ELABORATIONS IN METAPHORIC PROSE.

It has been assumed that in order to understand a text in its metaphoric sense, three different stages have to take place, (see Searle, 1979). People have to understand it first literally, then they have to grasp the metaphoric sense, and finally they have to process this sense.

It has been found that this three-stage processing occurred either at encoding, or at retrieval. When subjects were presented the text simultaneously with the pictures, (Chapter III), a significant interaction was found between testtime and cue presentation. When the metaphoric cue was given at encoding (before subjects read the text and saw the pictures), subjects had a low performance when they were tested immediately. It seems that they only process the material in its literal sense, remaining in the first stage of the process.

However, when the test was delayed, their performance improved enormously, being the highest performance in recall.

Subjects did go through the three stages of processing this kind of material, and it appears that they need time to elaborate the material. As Anderson and Reder (1979) have pointed out: "The act of elaborating text is basically, "exercising" the reader in thinking about the content ".

When metaphoric sense is involved, people should think more about the content, in order to get all the message. They need to make more elaborations about the material that is, to process it in a "deeper" level, (in Craik and Lockhart's terms).

On the contrary, when the text was also presented

simultaneously with the pictures, and the metaphoric cue was given at retrieval, the inverse effect was found. When subjects were tested immediately, they were able to re-elaborate the material at the moment the metaphoric cue was given. They might say to themselves: "Ah, Ah ! (Eureka!), now the text makes sense", and therefore their recall was improved. They went through the three stages, being the last two at retrieval.

However, when metaphoric cue was given with a delay of 24 hours, subjects in this condition were not able to re-elaborate the text and pictures with this new information, and therefore their recall declined.

So, it seems that processing metaphoric prose implied a three-stage processing, being a construction of holistic information, completely integrated with the subjects' know-ledge, the material to be learned and extra metaphoric info-rmation acting as the appropriate cue. This construction could either take place at encoding or at retrieval.

III) THE ROLE OF SCHEMA IN PROSE PROCESSING AND IN PICTURES.

The concept of schema has been accounted for processing both verbal, either literal or metaphoric prose, and visual material. Schemata are mental structures internalized in order to represent people's knowledge of the world.

In relation to text processing, people have to select and to "instantiate" a schema that can account for the information involved in a particular text. This instantiated schema will be stored in the memory system for its subsequent recall.

In the Balloon study (Chapter II), subjects when tested immediately were able to select and instantiate the schema either when they saw the pictures before (Context Before), or when they saw them simultaneously with the text (Context Simultaneous). The fact that no significant differences were found between these two conditions might be due to the similarity of schema or schemata activated by them. When subjects saw the pictures before, they could form a schema appropriate to comprehend the whole situation, (balloons, wires, electrical devices etc). When they heard the text afterwards, the information already activated by the schema corresponded to the text they heard, and therefore recall was good.

When subjects heard the text simultaneously,(i.e.while looking at the picture), they also had the appropriate context to understand the whole situation, and they could select and instantiate a similar schema to the condition described before.

On the contrary, when subjects heard the text without the picture, they could form a schema that did not correspond

to the one they had when text and pictures were presented again, and therefore a "mismatch" of schemata could occur.

These three results reported in the first experiment (Chapter II), seem to show that the schema is only formed at encoding, and therefore support Bransford and Johnson's results (1972).

However, as Anderson (1978) has pointed out, schema or schemata can be formed either at encoding or retrieval, (Pichert and Anderson, 1977; Anderson and Pichert, 1978).

Using the newspaper as a text, (Chapter III), and giving the metaphoric cue at retrieval after subjects had simultaneously read the text and seen the pictures, they were able to re-elaborate the material, as was pointed out in the last section of this concluding chapter. Subjects were able to activate the appropriate schemata at retrieval, when this new metaphoric information, the cue, was provided. Once these schemata were activated, they were able to understand, and to remember, the whole situation. Therefore, it seems that schemata can be formed either at encoding, or retrieval depending on the particular situation.

With regards to recalling or recognizing pictures reported in the same experiment (Chapter III and IV), when subjects had them presented on their own and were asked to recall details of them or just to recognize them, they were also able to activate "scene schemata" (as Mandler and associates have suggested) in order to remember them.

To conclude, it seems that schemata can operate for both verbal and pictorial material, therefore they can be applied to different situations. Schemata can also be embedded in other schemata, implying that people's knowledge

of the world is organized hierarchically. It might be that there must exist some kind of hierarchy, but it is difficult to determine whether all knowledge has to be hierarchical. Schemata could also vary in their level of abstractness. People may encode information, then represent it in different levels of abstraction (i.e. metaphoric prose versus details of photographs). Finally, schemata are representations of general knowledge that people have about the world. These four characteristics pointed out by Rumelhart and Ortony (1977) could describe how schemata could be formed and activated and so, account for the results reported in this thesis.

Several issues remain unclear at the end of this study, and more research will be necessary to resolve them.

It will be interesting to see whether there really is a "mismatch" of schemata , when subjects have a context and subsequently they are confronted with a different one for the same information.

Another interesting point is to "induce" subjects to process a text in its metaphoric sense, by saying the "metaphoric moral" of the text, or by asking them about the metaphoric sense before a recall task is involved. Comparisons between intentional and incidental tasks would show if the processing of metaphoric material takes place much in the same way. It is worthwhile to explore more about the kinds of elaborations people made in processing either literal or metaphoric prose.

Finally, it will be interesting to examine how books

or passages of them, for example children's books, have to be written in order to be better understood and remembered. This aspect is important because, for example, research on reading processes have to take into account this kind of problem and situation. For instance, it will be important to explore whether pictures are necessary devices for illustrating texts and for helping children to follow them better, and therefore to comprehend and remember them well.

Finally, an important methodological issue has remained unsolved at the end of this thesis. It has to do with the construction of a more suitable recognition test for both literal and metaphorical prose, which could be compared to traditional recognition tasks.

As a concrete example of the research design proposed an experiment could be set up using two different story prompts (which in this case will act as the context of the proverb) to introduce the proverb: "Great weights hang on small wires".

Subjects: A total of 160 subjects would be required - 80 University students and 80 working-class adults, each group balanced for sex.

Materials: Two different story prompts would be used to introduce the proverb:

(i) "The girl's future career depended upon her performance in this exam paper. She looked disappointed when she came out from the the exam and said 'Great weights hang on small wires'."

(ii) "The customer wanted to buy a heavy weight to use as a pendulum. The saleswoman came out and said 'Great weights hang on small wires'."

To construct the recognition test the following set of sentences would be used:

~~(a) A different~~ proverb, with different meaning and wording.

(For (a) and (e), see Smith and Heseltine, "The Oxford Dictionary of English Proverbs", Oxford: Clarendon Press, 1935.)

(b) A paraphrase of the proverb's metaphoric meaning in the concrete context provided by the prompt, e.g.: "The outcome of the exam depended on the teacher understanding her handwriting."

(c) A sentence including words identical to those appearing in the original proverb, e.g.: "Weights hang on wires."

(d) A paraphrase of the proverb's literal meaning, e.g.: "The large weight was hanging on a small hook."

(e) A different proverb, with similar meaning but different wording, e.g.: "

Procedure: Within each group, subjects would be allocated randomly to the different conditions. The design would be 2 x 2 x 2 between subjects. The first factor would be Context: the first level would be Literal (saleswoman), the second level would be Metaphorical (exam). In both conditions subjects would hear the story from a tape recording (approximately 4 seconds long). Subjects would then be given the following instructions: "Now you will hear a set of six sentences and you are asked to recognise the one said by the subject of the story." Subjects would then choose one sentence from the set of six (the five described above, (a) to (e), plus the original proverb). Assuming that levels of literacy will vary between groups of subjects, the precaution would be taken of performing the experiment on each subject individually, and the responses would be orally collected by the experimenter.

The second factor will be Social Class: the first level University students and the second adult Working Class. The

third factor would be Test Time: the first level Immediate, the subjects being tested immediately, the second level Delayed, the subjects being tested after an interval of 24 hours.

Given the above design there will 20 subjects in each condition The ANOVA would reveal any dependance of the probability of correct recognition on each of the three main factors. The recognition scores would, of course, be corrected for false recognitions.

The nature of the errors in this task would also throw light on a problem that has already been mentioned: what units should be considered in evaluating a recognition test for prose? Errors of type (a) would be uninformative; errors of type (c) would indicate that the distractors in a recognition test should perhaps consist of identical words to those used in the original; on the other hand, errors of type (e) or (b) would suggest a deeper level of processing, and hence that idea units should be used.

Finally, it would be possible to explore further the nature of the relations between context and literal or metaphorical processing by repeating the above experiment with a modification: subjects would be asked not only to recognise the original proverb, but also to choose a second sentence which they think is closely related to the original. The ANOVA would in this case be computed on these latter responses, with the advantage that if the correct recognition rate were too high on the first questior the responses to the second would allow contextual effects still to manifest themselves. An alternative would be to introduce an artificial source of difficulty in answering the first question

in order to increase the error rate. However, what this might gain in experimental elegance might be lost in terms of ecological validity, i.e. of the meaningfulness of the task to the subjects.

APPENDIX I.

IDEA UNITS.BRANSFORD AND JOHNSON' S TEXT.

1) Balloons popped.
2) Sound not able to carry.
3) Far away from correct floor.
4) A closed window prevents the sound.
5) Buildings tend to be well insulated.
6) The operation depends on a flow of electricity.
7) A break in the middle of the wire causes problems.
8) The fellow could shout.
9) The human voice is not loud enough.
10) Another problem is that a string could break on the instrument.
11) There could be no accompaniement to the message.
12) The best situation would involve less distance.
13) Fewer potential problems.
14) Face to face contact avoids most problems.

APPENDIX II.

IDEA UNITS.LITERAL TEXT. (From "El Alcazar" newspaper).

1) Horse race.
2) The young rider Anthony Webber and his horse 'Anitacat' are out of the race.
3) The Steeplechase race is a begginer's event.
4) This race is a training ground for big races.
5) Top riders in the world take part in famed races:Derby, Epson,and Grand National.
6) The Duque of Albuquerque has participated in these famed races on so many occassions.
7) It is like a reel of film which is being run backwards.
8) Nothing has happened.
9) Steel mounts.
10) Less dangerous.
11) You never can tell.
12) Preparations are under way for the mayor cycling seasons: "La Vuelta","Il Giro",and "Le Tour".
13) Cyclists will have to be sifted through local events
14) such as "The Three Provinces" held in Valencia.
15) The prizes to be won are pictured on the stand.
16) In Jaca,there is an ice hockey match.
17) In Spain,we are the champions of hockey on skates.
18) Spain is the Silver Medal in grass hockey.
19) Grass hockey is the true kind of hockey.
20) There is not much to be said on ice hockey.
21) Spain was beaten by Canada.
22) Canada's team have proved their worth.
23) Indoor athletics are considered a training
24) for big outdoor athletic competitons.
25) In New York Vigneron of France won the pole-vaulting contest.
26) His countryman Houvion was second.
27) They both gave a freight to the Polish athlete
28) at the Olympic Games held in Moscow.

APPENDIX III.

HISTORICAL AND POLITICAL BACKGROUND.

Lieutenant Colonel Antonio Tejero is very well known for his participation in different attempted military coups.

The first one took place in December 1979,when he tried to seize the residential palace of the Prime Minister Adolfo Suarez.This attempt was called "Operation Galaxia".Although Tejero was judged by a military court,the sentence was very lenient and he returned to his military post at the Guardia Civil.

In February 23rd 1981,Tejero lead the Guardia Civil troops who seized the Spanish Parliament (including all members of the Cabinet) at the moment the MP's were electing a new Prime Minister.In connection with the seizure of the Parliament,and the same day,the Commander in Chief of Valencia provinces (Castellón,Valencia,Alicante) Lieutenant General J.Milans del Bosch took out the tanks in the streets of Valencia,imposing the martial law and assuming all civil and military powers in the provinces under his command.

Both Tejero and Milans del Bosch were expecting to be supported by other military forces,especially the strongest Spanish military unit which is an Armoured Divisicn in Madrid.However,neither the Navy nor the Air Forces seemed to have been involved.

The following day,while the Parliament was still under Tejero's arms,the right-wing daily newspaper "El Alcazar", from which the text was chosen for some of the experiments reported in this thesis,published a manifesto in its first edition in favour of the military coup.This edition never reached the public because the Provisional Cabinet acted to prevent its distribution.But the fact that the manifesto had been pressed was reported in all the mass media.

Although Tejero and other visible heads of the coup were detained,the political situation remained unresolved while the Goverment was trying to reach some kind of agreement with the rebelious arm forces.During this negotiation it

was a psychosis of inestability among the general population and widespread rumours of another military coup.

On the other hand,and a few days later,France was going to have a general election with a forecast Socialist victory.

Also the Polish situation was becoming more and more tense with a Polish Communist Party under the pressures of both Solidarity and the Soviet Union.

APPENDIX IV.

IDEA UNITS.METAPHORIC TEXT. (From "El Alcazar" newspaper).

1) Attempted military coup.
2) Lieutenant Colonel Antonio Tejero (Anthony Web).(To web means "tejer" in Spanish).
3) "Here nothing has happened".(Tejero's sentence at the Parliament).
4) Military rehearsal for a national take over.
5) Lieutenant Colonel Tejero and/or the attempted coup has failed.
6) Lieutenant Colonel Tejero will be trialed i.e. he is out of the "race".
7) For a moment Spanish history seems to be run backwards i.e. to Franco's military dictatorship.
8) The seizure of the Parliament and the subsequent dissolution of the democratic institutions.
9) A military "hero" is expected to address to the parlamentary hostages under the countersign of "Duque of Ahumada".
10) Armed forces do have indeed more dangerous and "convincing" arguments.
11) such as armoured vehicles and tanks.
12) These armoured vehicles are less dangerous,although it is not clear for whom they are so.
13) The take over of both the Parliament and the city of Valencia is a preparation for a bigger operation at a national scale.
14) Participation in local operations,as the one held in Valencia (Milans del Bosch) would be considered as a merit to become a national leader.
15) The prizes to be won have already been agreed upon them.
16) It is assumed that the Spanish army (hockey on skates) will support the attempted coup as it has done in the past half century.
17) The key roles in the coup will be played by the Guardia Civil and the Cavalry (grass hockey).
18) There is not much information about the reaction to the

military coup in the Air Forces and the Navy (ice hockey).

19) The lengthy preparation of the whole operation inside the barracks (indoor athletics) should be considered as a warming-up of engines for a big outdoor military take-over.

20) Foreign political situation has to be taken into account. Mainly the French elections and the United States reaction on the one hand,and the Polish situation and Moscow answer on the other.

APPENDIX V.

IDEA UNITS.PICTURES. (From "El Alcazar" newspaper).

1) Horse falls.
2) Rider falling down.
3) Number of people watching the race.
4) Men or women watching the race.
5) Fence.
6) Another horse taking part in the race.
7) A second jockey maintains his balance.
8) Numbers on the horses.
9) The jockey has got his foot on the stirrup.
10) Jockey's gogles.
11) Jockey's cap.
12) Stirrup up in the air.
13) Horse's legs buckled under its body.
14) Straw on the ground.
15) Grass.
16) Table.
17) Table's cloth.
18) Poster.
19) Names of Castellón,Valencia and Alicante on the poster.
20) Number of trophies.
21) T -shirt.
22) Size of trophies.
23) Distribution of trophies,the biggests at both extremes of the table.
24) Picture in the background.
25) Curtains.
26) Trophies.
27) Removals "Los Ochando"
28) Floor.
29) Ice hockey match.
30) Players turning their back.
31) Numbers on players' shirts.
32) Number of players.
33) Players taking part in the match at the background of

the picture.

34) Public watching the match.

35) Publicity on the walls.

36) Winston.

37) Mercedes.

38) Flex.

39) Substitutes players watching the match.

40) Players' helmets.

41) Teams' colours.

42) Emblems and stripes in teams' colours.

43) Hockey sticks.

44) Hockey puck.

45) Pole-vaulting.

46) Pole-vaulter decending.

47) Outstretch arms.

48) Feet not touching the ground yet.

49) Absence of pole.

50) Publicity at the background.

51) Pole-vaulter's shoes.

52) Pole-vaulter's shirt.

53) Pole-vaulter's shorts.

54) Pole-vaulter's socks.

55) Lights-on in the background.

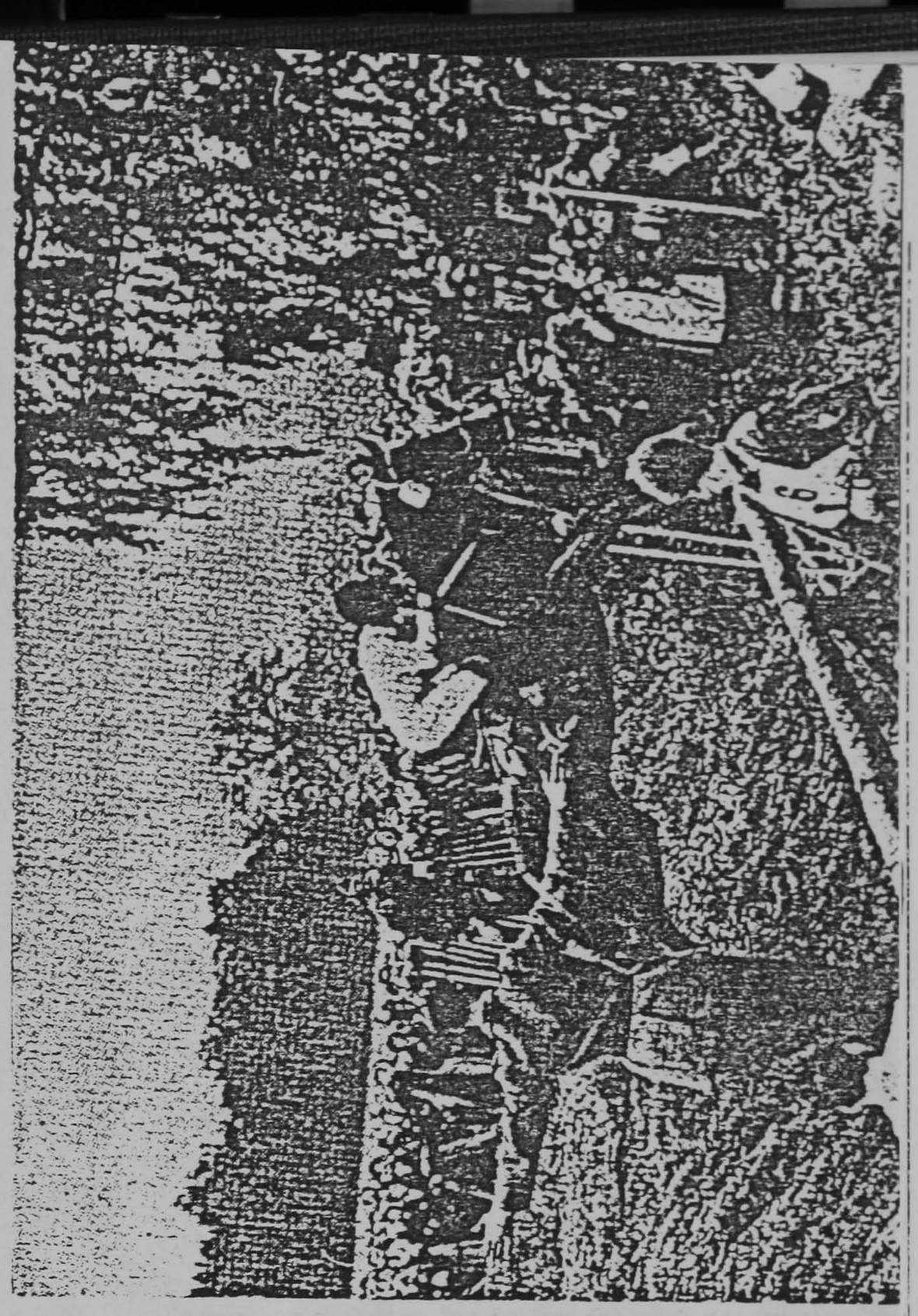
56) Pole-vaulting bar.

57) Dark background.

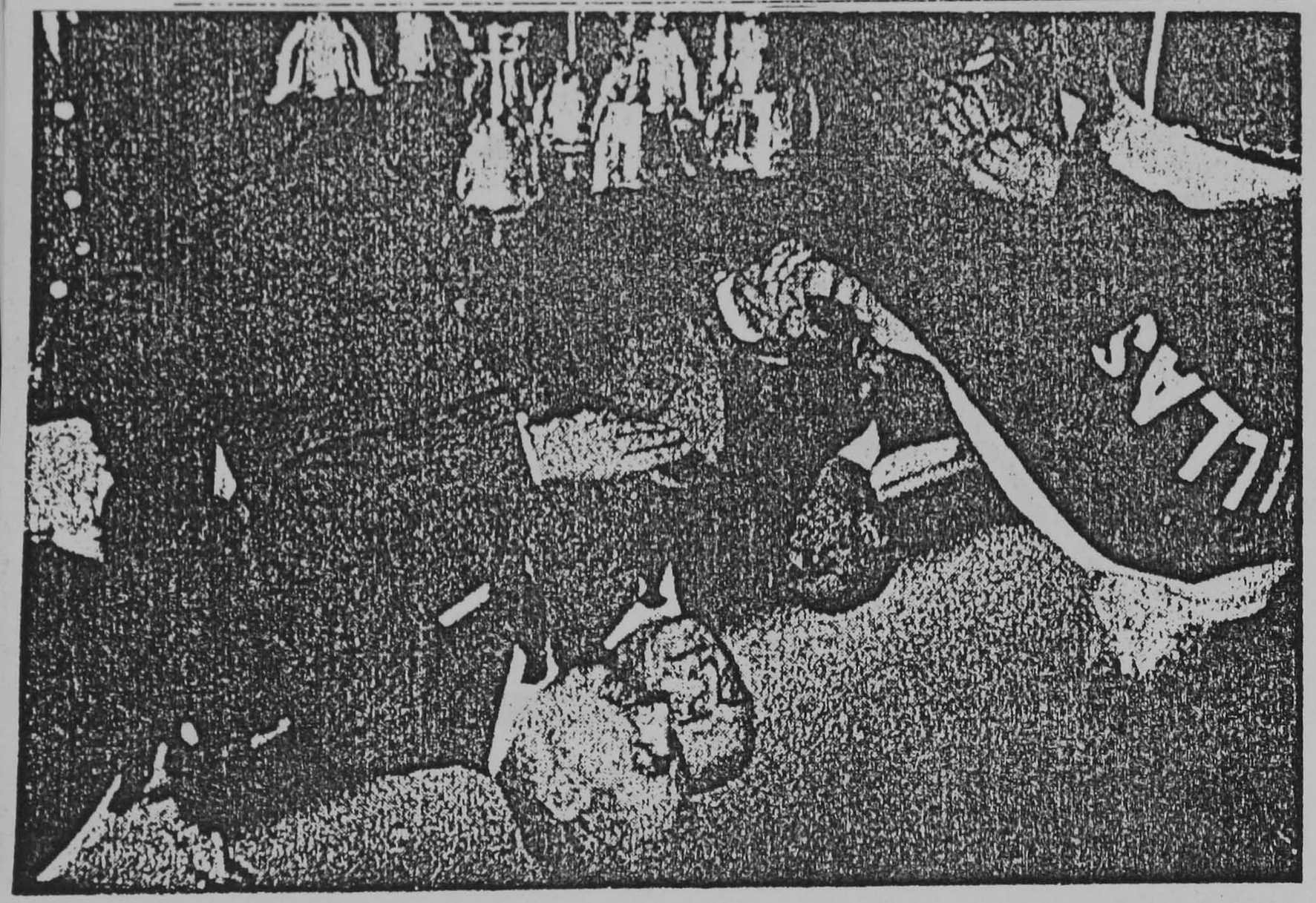
58) Pole-vaulter's head turning left.

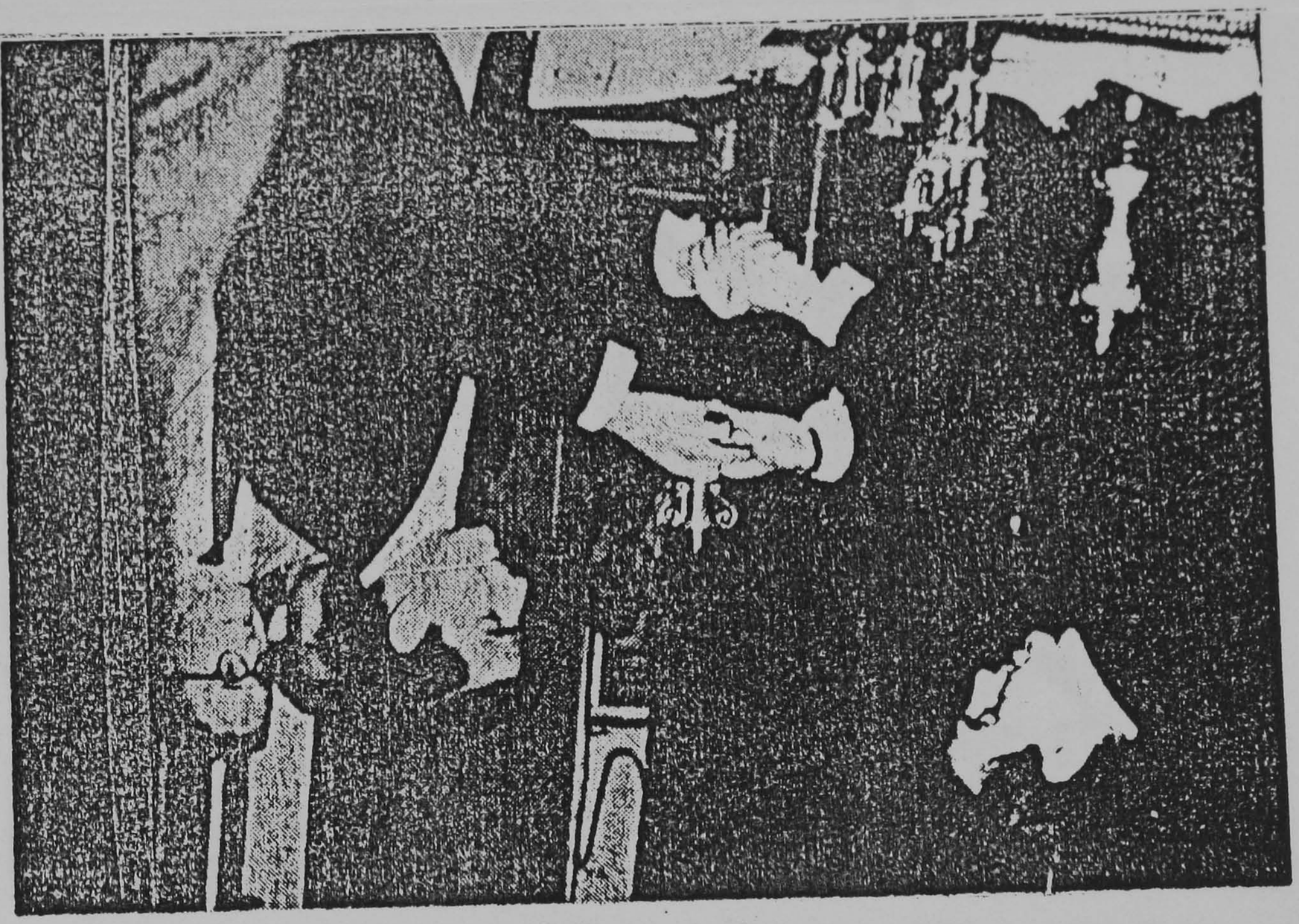
59) Pole-vaulter's hands open.

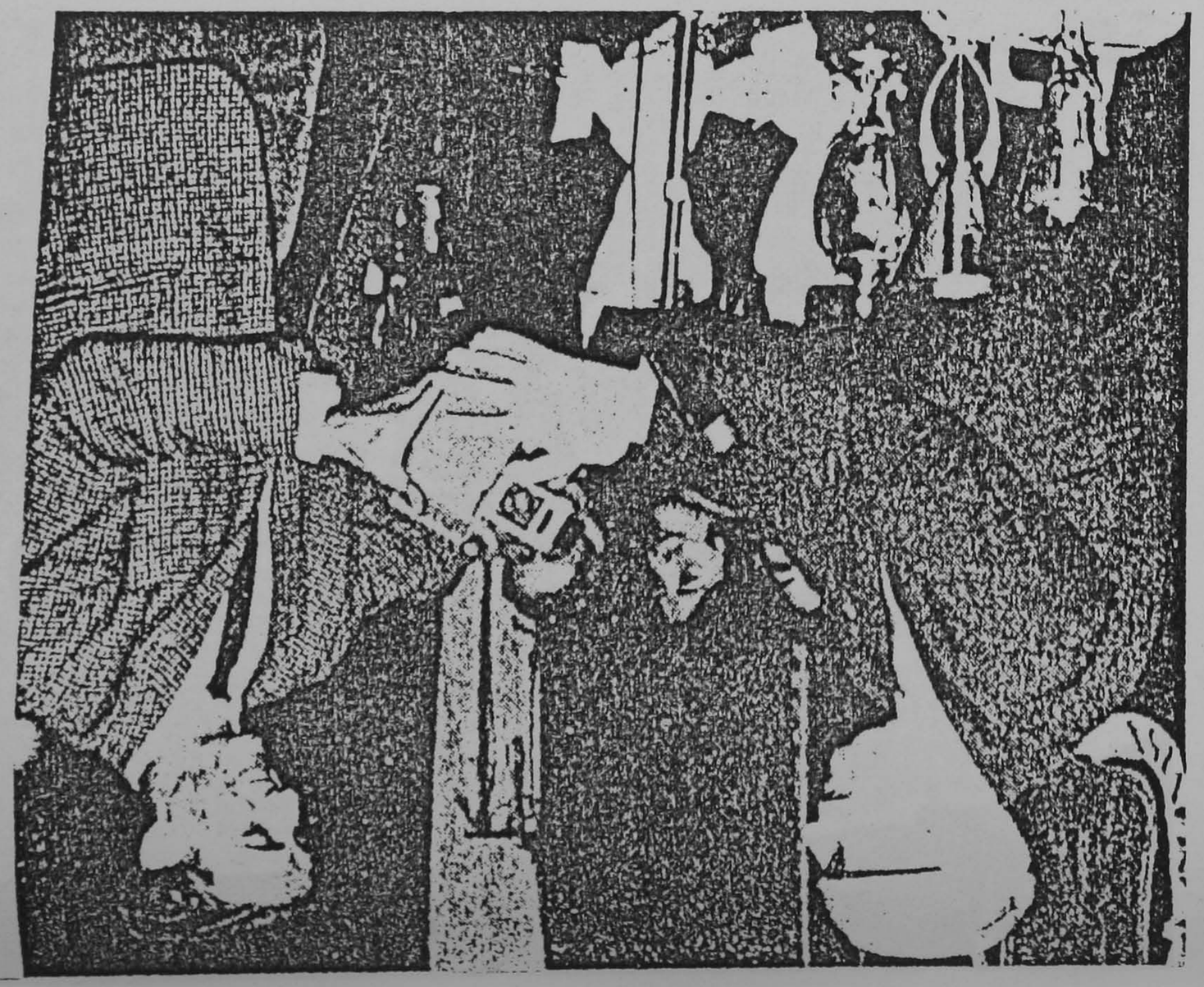
60) Pole-vaulter's legs astride.

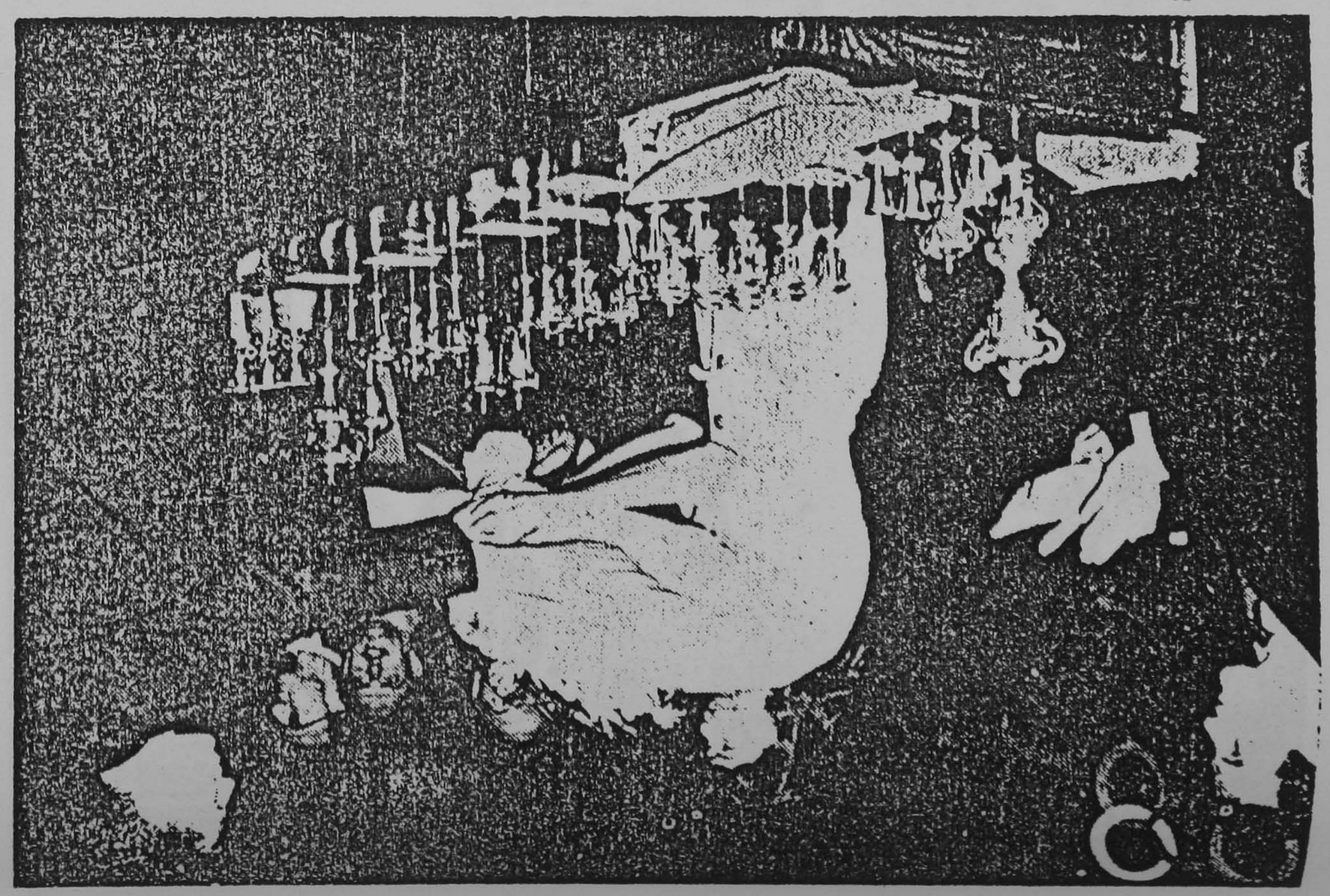


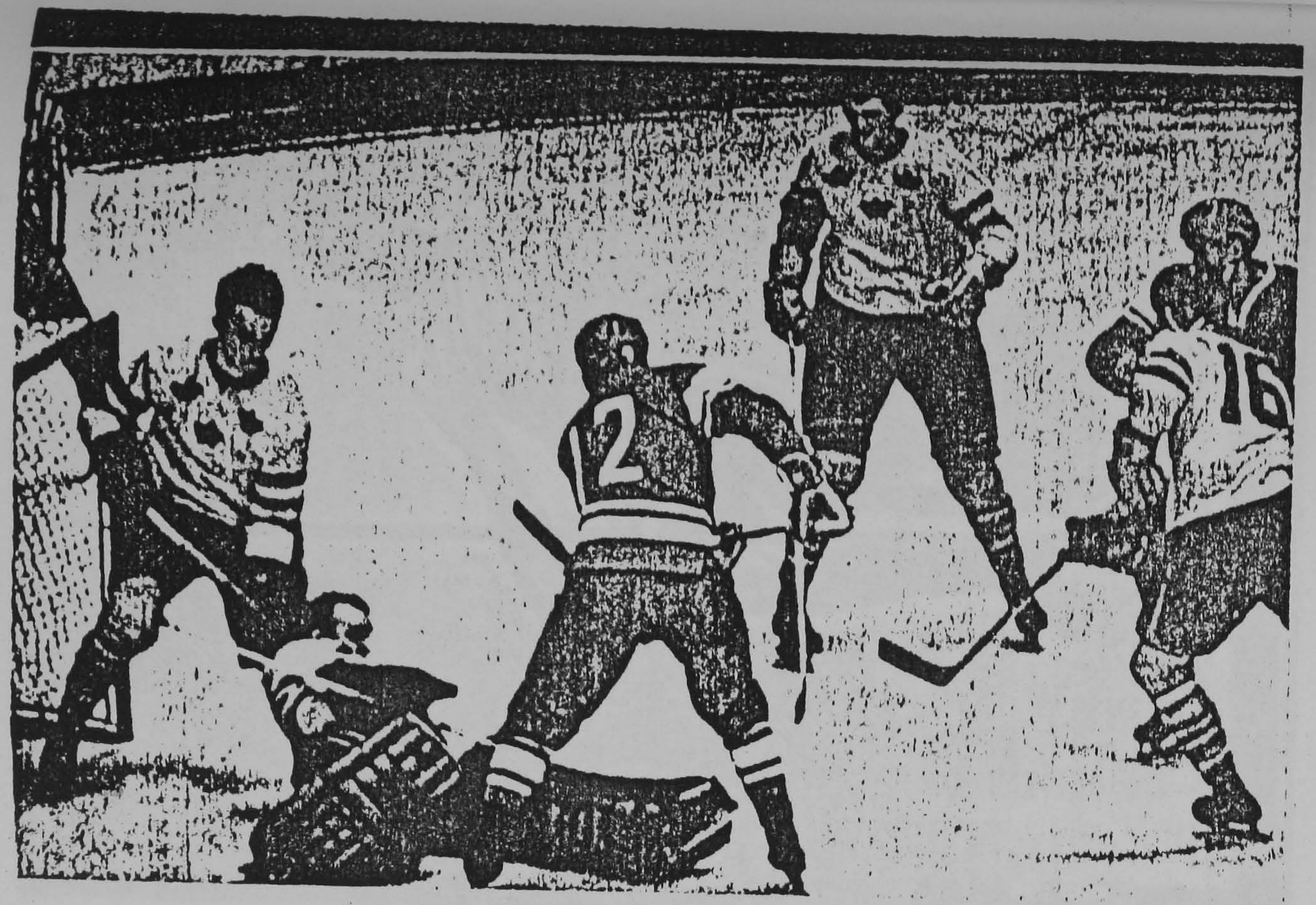
APPENDIX VI. PICTURES USED AS DISTRACTORS.







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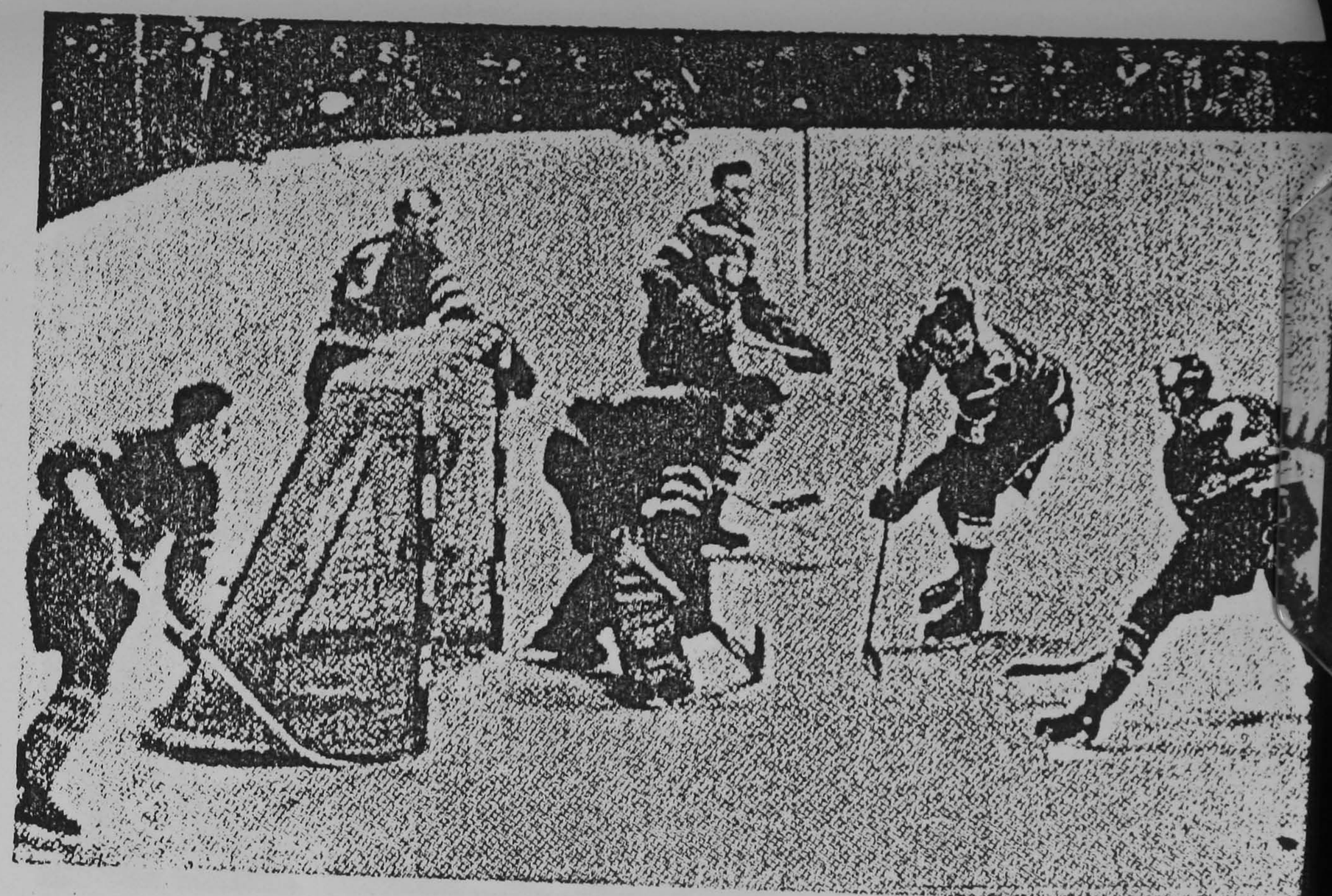

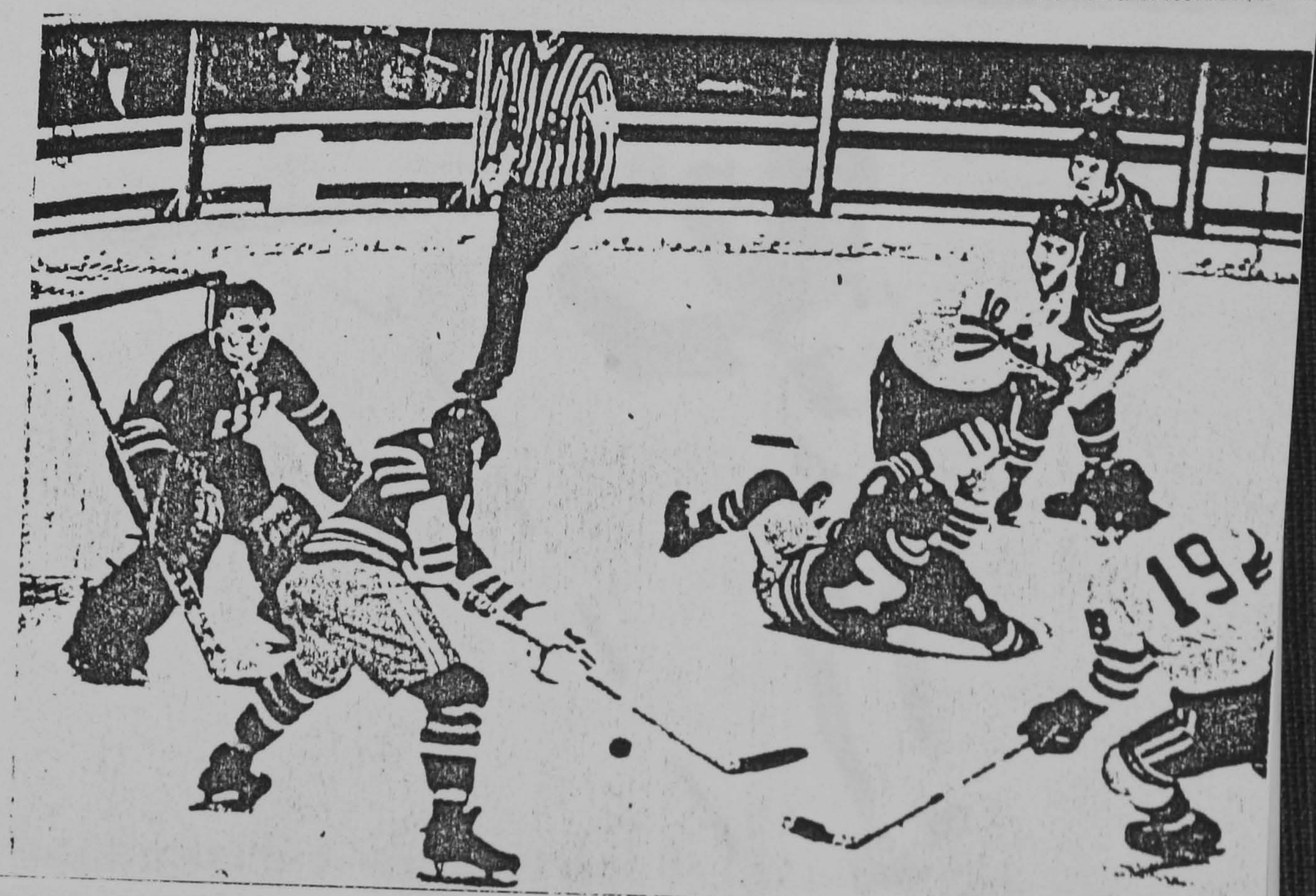

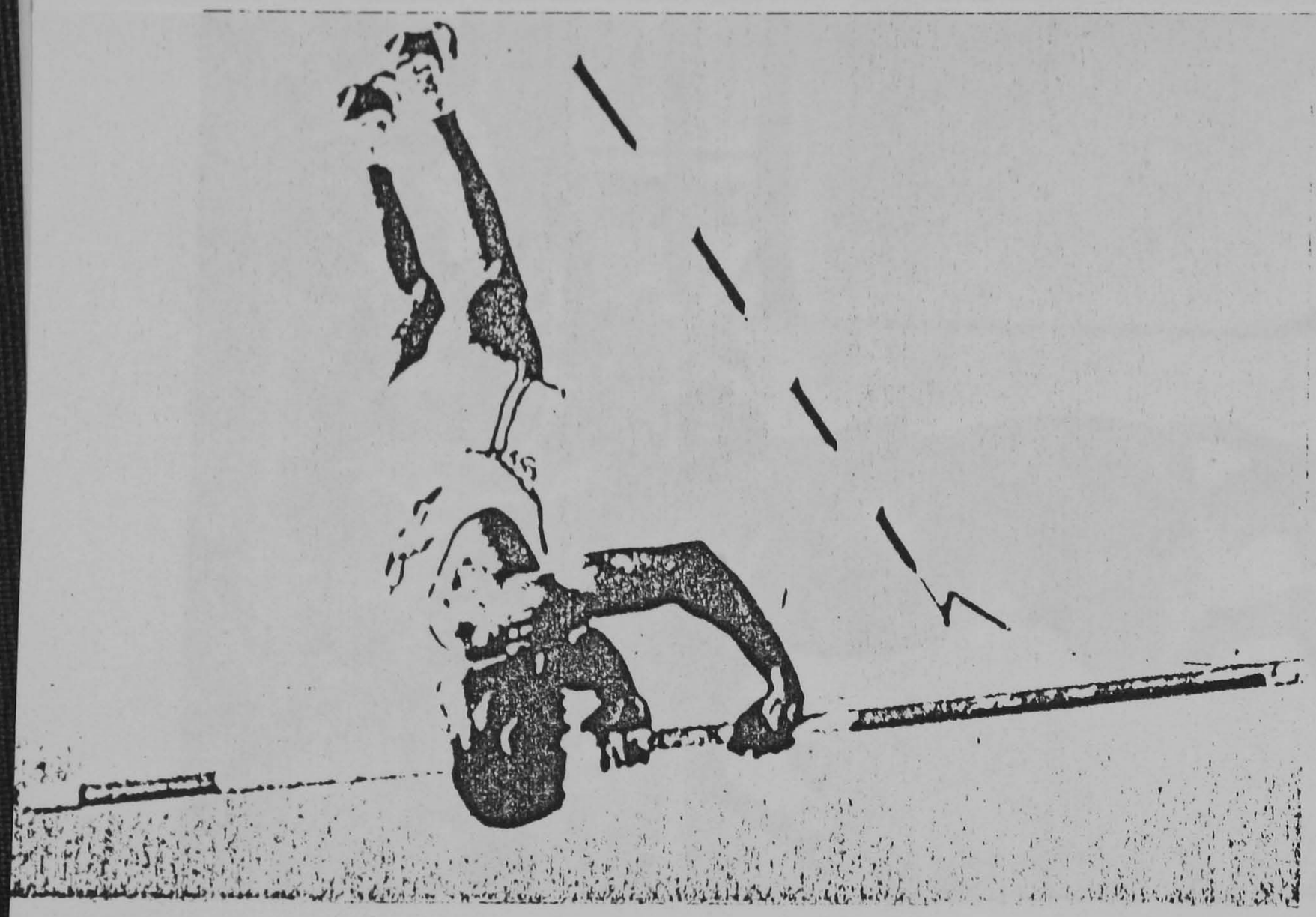

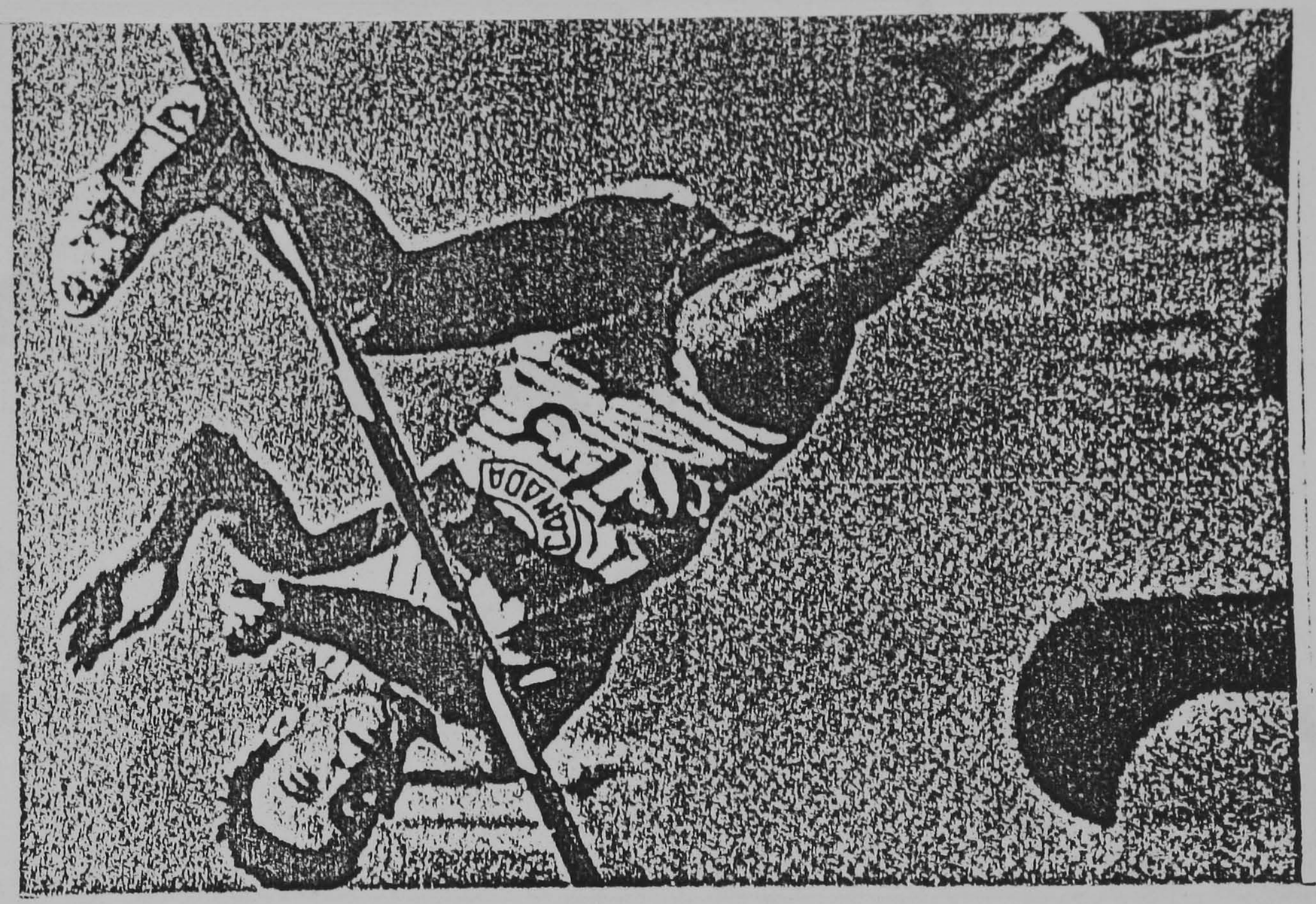

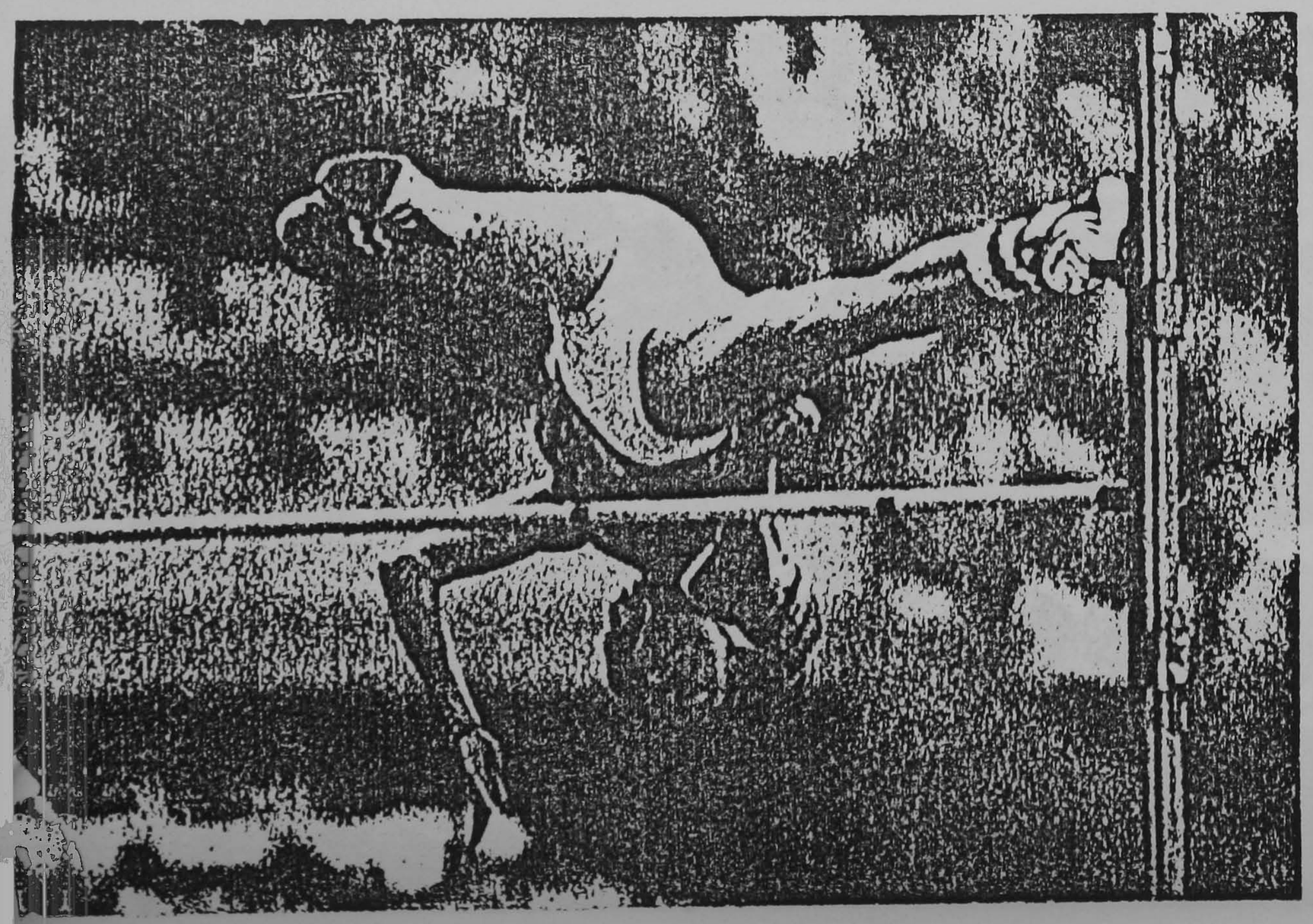

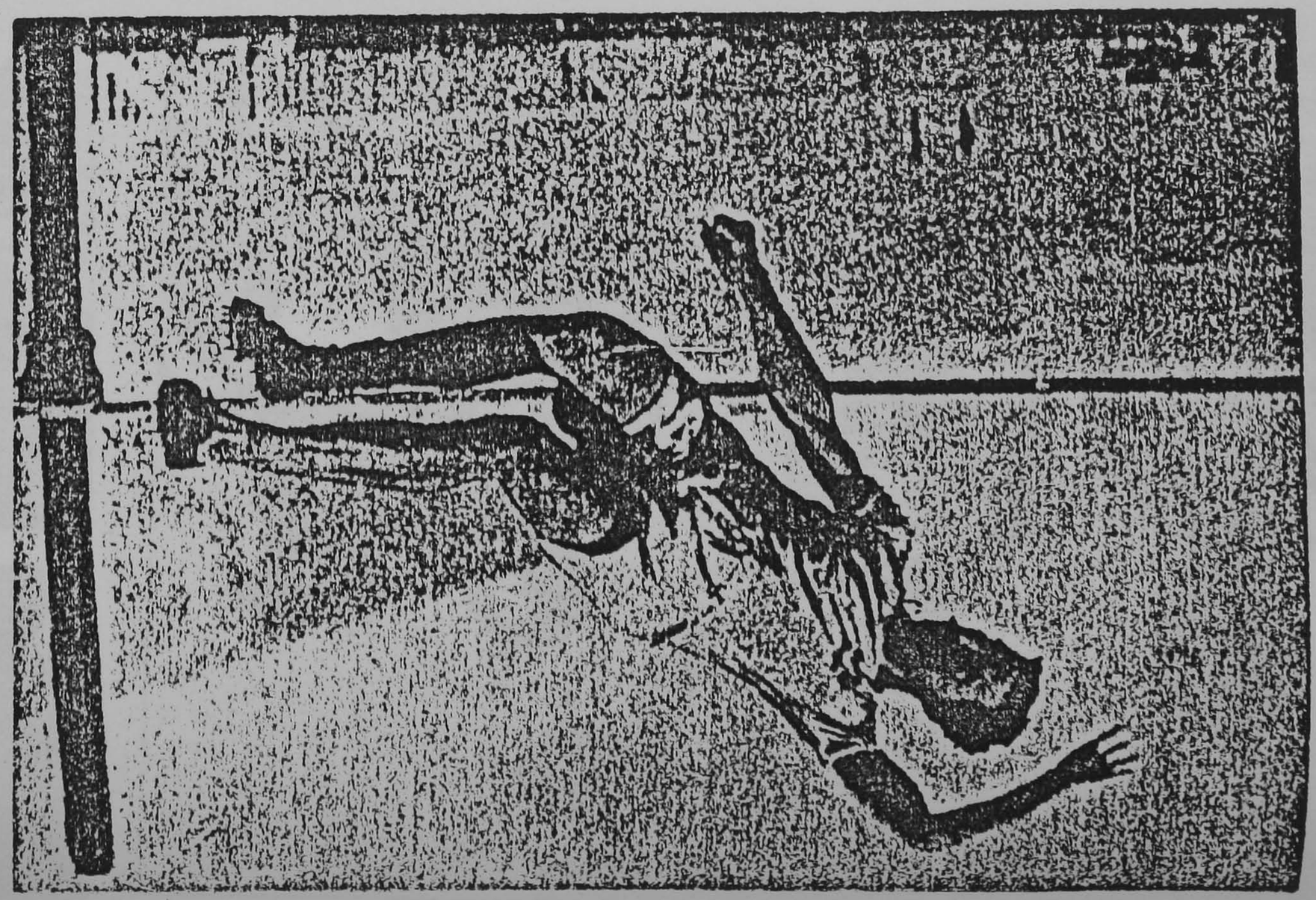

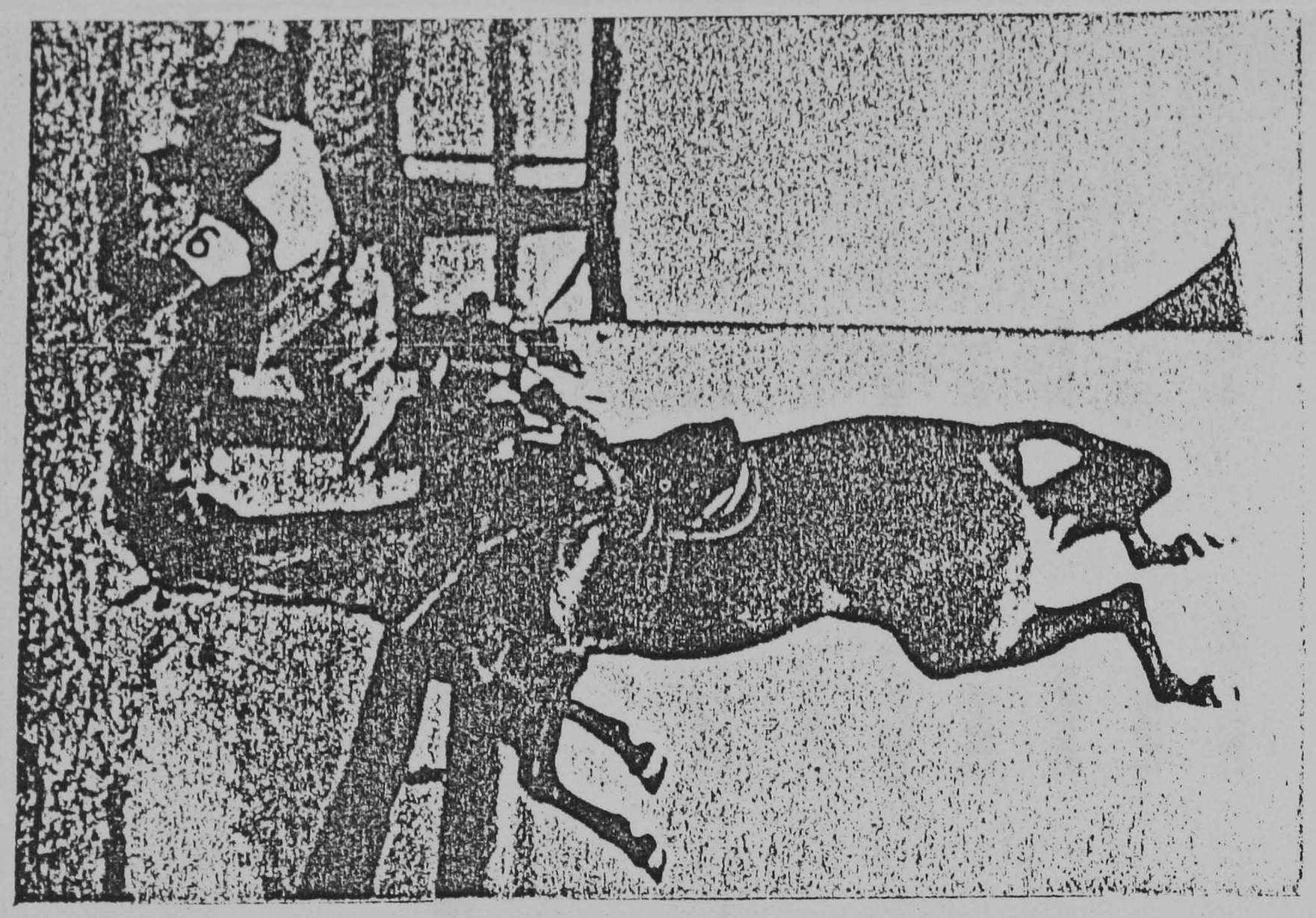

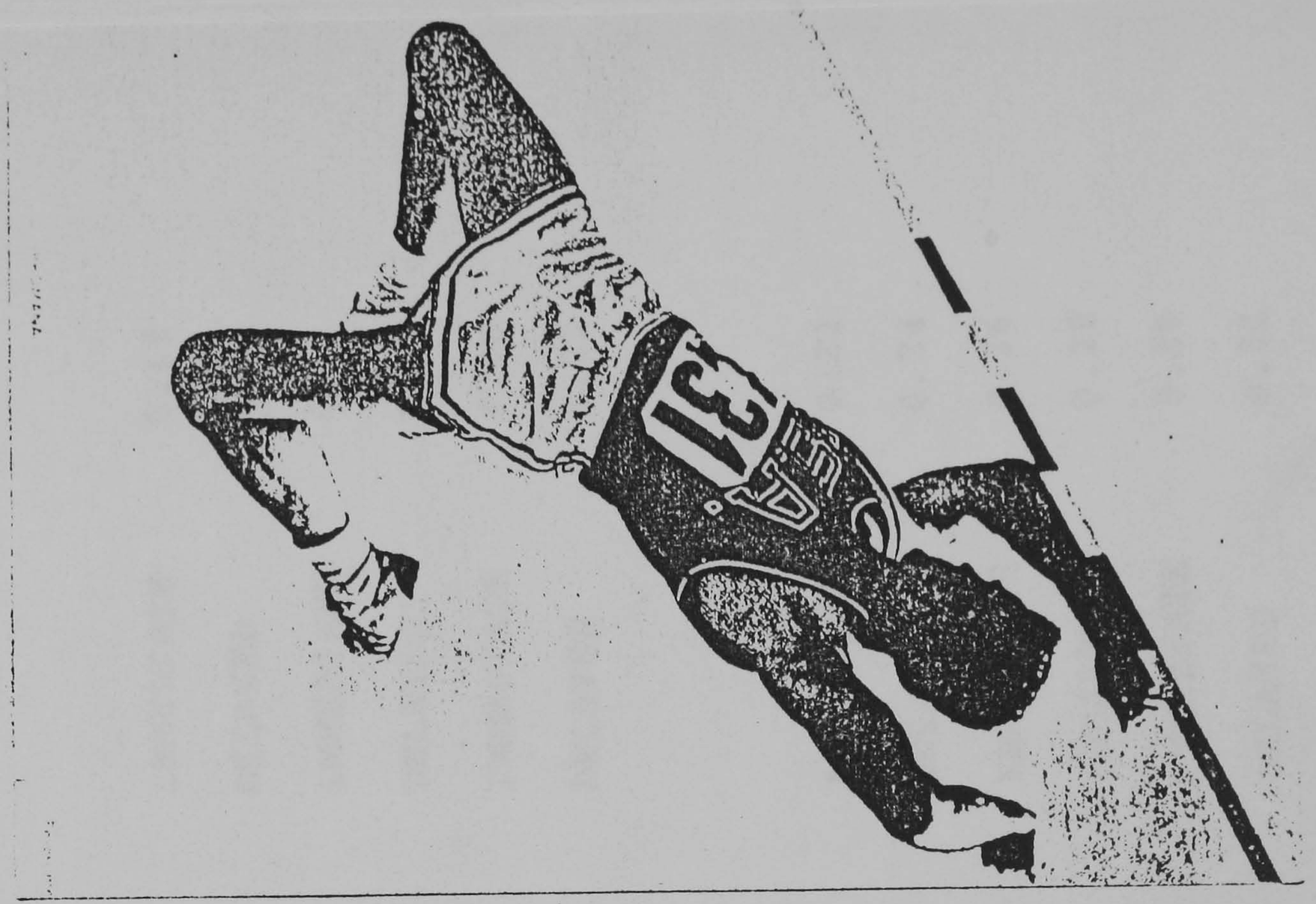

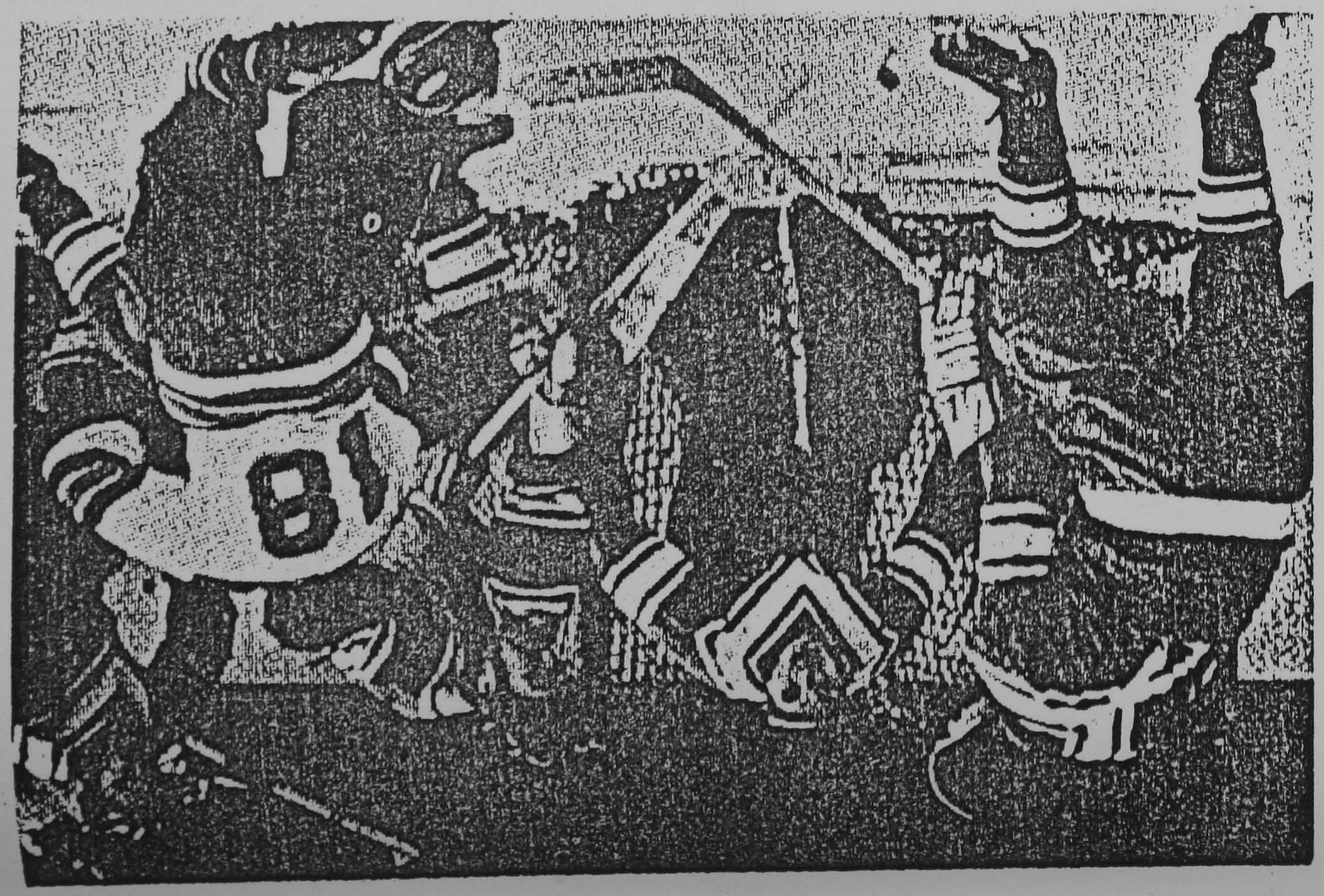

APPENDIX VII.

MEAN PROPORTIONS OF SENTENCES FALSELY RECOGNISED (DISTRACTORS) ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	$\bar{X}$
SIMULTANEOUS	NOCUE	IMMEDIATE	0.16
	NOCUE	DELAYED	0.22
	PRECUE	IMMEDIATE	0.21
	PRECUE	DELAYED	0.26
	POSTCUE	IMMEDIATE	0.19
	POSTCUE	DELAYED	0.20
BEFORE	NOCUE	IMMEDIATE	0.19
	NOCUE	DELAYED	0.24
	PRECUE	IMMEDIATE	0.19
	PRECUE	DELAYED	0.25
	POSTCUE	IMMEDIATE	0.30
	POSTCUE	DELAYED	0.21
AFTER	NOCUE	IMMEDIATE	0.21
	NOCUE	DELAYED	0.24
	PRECUE	IMMEDIATE	0.26
	PRECUE	DELAYED	0.28
	POSTCUE	IMMEDIATE	0.26
	POSTCUE	DELAYED	0.21

APPENDIX VIII.

MEAN d' OF SENTENCES RECOGNISED IN THEIR LITERAL SENSE ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	d'
SIMULTANEOUS	NOCUE	IMMEDIATE	2.07
	NOCUE	DELAYED	1.36
	PRECUE	IMMEDIATE	1.44
	PRECUE	DELAYED	1.29
	POSTCUE	IMMEDIATE	1.57
	POSTCUE	DELAYED	1.23
BEFORE	NOCUE	IMMEDIATE	1.32
	NOCUE	DELAYED	0.89
	PRECUE	IMMEDIATE	1.42
	PRECUE	DELAYED	0.88
	POSTCUE	IMMEDIATE	0.92
	POSTCUE	DELAYED	1.38
AFTER	NOCUE	IMMEDIATE	1.35
	NOCUE	DELAYED	0.73
	PRECUE	IMMEDIATE	0.75
	PRECUE	DELAYED	0.64
	POSTCUE	IMMEDIATE	1.16
	POSTCUE	DELAYED	1.09

APPENDIX IX.

MEAN PROPORTIONS OF PICTURES FALSELY RECOGNISED (DISTRACTORS) ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	$\bar{X}$
SIMULTANEOUS	NOCUE	IMMEDIATE	0.06
	NOCUE	DELAYED	0.03
	PRECUE	IMMEDIATE	0.03
	PRECUE	DELAYED	0.03
	POSTCUE	IMMEDIATE	0.04
	POSTCUE	DELAYED	0.03
BEFORE	NOCUE	IMMEDIATE	0.02
	NOCUE	DELAYED	0.01
	PRECUE	IMMEDIATE	0.01
	PRECUE	DELAYED	0.01
	POSTCUE	IMMEDIATE	0.01
	POSTCUE	DELAYED	0.01
AFTER	NOCUE	IMMEDIATE	0.01
	NOCUE	DELAYED	0.02
	PRECUE	IMMEDIATE	0.06
	PRECUE	DELAYED	0.04
	POSTCUE	IMMEDIATE	0.02
	POSTCUE	DELAYED	0.03

APPENDIX X.

MEAN d' OF PICTURES RECOGNISED ACCORDING TO CONDITIONS.

PRESENTATION	CUE	TEST	d'
SIMULTANEOUS	NOCUE	IMMEDIATE	5.06
	NOCUE	DELAYED	5.64
	PRECUE	IMMEDIATE	5.41
	PRECUE	DELAYED	4.68
	POSTCUE	IMMEDIATE	5.11
	POSTCUE	DELAYED	5.02
BEFORE	NOCUE	IMMEDIATE	5.68
	NOCUE	DELAYED	6.44
	PRECUE	IMMEDIATE	6.28
	PRECUE	DELAYED	6.53
	POSTCUE	IMMEDIATE	6.54
	POSTCUE	DELAYED	4.84
AFTER	NOCUE	IMMEDIATE	5.98
	NOCUE	DELAYED	5.73
	PRECUE	IMMEDIATE	5.99
	PRECUE	DELAYED	5.20
	POSTCUE	IMMEDIATE	5.59
	POSTCUE	DELAYED	5.33

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