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## Abstract

Among the tasks usually carried out by conference interpreters, the question was which task demands most attention or is the deepest in terms of the depth of processing hypothesis proposed by Craik and Lockhart (1972). Simultaneous interpretation is a complex form of human information processing, involving the perception, storage, retrieval, transformation and transmission of verbal information. Shadowing involves the immediate vocalization of auditorily presented stimuli in the same language, whereas simultaneous interpretation involves translation of the incoming message. The consecutive interpreter listens to a message in  $L_1$ , makes concurrent notes in  $L_2$ , and then delivers an oral translation of the original speech by way of his notes.

In Experiment I, conference interpreters (both trainee and professional) shadowed, interpreted simultaneously and consecutively, as well as listened to French passages before (a) recalling in English and (b) answering three recognition tests in source language measuring lexical, semantic and syntactic retention. Listening and consecutive interpretation, which yielded significantly higher recall scores than did shadowing, were considered deeper forms of processing than shadowing. Also, simultaneous listening and speaking impaired recall of the material.

A second experiment eliminated the translation variable. Subjects listened to, shadowed and interpreted consecutively, English passages, followed by retention measures in the same language. Only consecutive interpretation (labeled as 'consecutive reiteration') yielded scores that were significantly higher than shadowing. Listening and recalling in the same language demands less processing or effort than listening in one language and recalling in another.

In a third experiment designed to examine the role played by notes, subjects (a) listened to, (b) interpreted a text consecutively and (c) took notes but had their notes unexpectedly removed and were asked to recall the original without rehearsal. Consecutive interpretation with notes kept during delivery yielded significantly

higher retention scores than either other condition. Listening is as good a form of attending to a message as note-taking when notes are an external form of encoding. Notes coupled with review represent a useful strategy for subsequent recall but note-taking alone is of questionable value.

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### IN MEMORY OF DAVID GERVER

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## Introduction

Since very little research seems to have been carried out in cognitive psychology using conference interpreters as subjects, the aim of this work was extremely pioneering in nature. Further, at the time the research was undertaken, an article by Craik and Lockhart (1972) on depth of processing had just introduced a bold attempt at defining human information processing in terms of a "depth-of-processing" approach.

After examining in some detail four tasks carried out by simultaneous and consecutive interpreters, be it in their formative years or as professionals, it was decided that these tasks, namely listening, shadowing, simultaneous interpretation and consecutive interpretation, could be put into a hierarchical order of some sort, in other words, which task seemed to be the most demanding or required the most attention on behalf of the subject.

After having heard fascinating anecdotes about simultaneous interpreters known to be able to knit, do crossword puzzles and in some cases even read detective novels whilst performing simultaneous interpretation in the booth, the author ventured to look into just how demanding each task might be.

In order to formulate and propose a hypothesis of my own, I decided to use listening as the control condition, one where nothing concrete or physically tangible could be measured. What is the subject listening for? Does he fade in and fade out? Does he listen to chunks or entire sentences? For that matter, is he even listening at all? For example, one of the experimental texts dealt with a topic familiar to most subjects: The Tunnel Across the Channel. Were subjects recalling material they had just heard or were they padding their recall with their prior knowledge about the Tunnel under the English Channel? Listening was used as a neutral, control condition and depending on the results obtained for recall following shadowing, simultaneous and consecutive interpretation, listening scores would then be re-integrated in the hierarchy.

Given the three remaining conditions, shadowing, simultaneous and consecutive interpretation, the next question was which one of these three tasks might be the least demanding for an interpreter?

At a first glance, the glaring difference between shadowing and simultaneous interpretation is that simultaneous interpretation involves translation whereas shadowing does not. On that premise alone, shadowing could be considered as less demanding a task for an interpreter than simultaneous interpretation.

The most difficult decision was to try and predict which of the two remaining tasks (simultaneous interpretation and consecutive interpretation) would require the deepest form of processing on the part of the interpreter. But the comparison is not as clear-cut as it is when comparing shadowing to simultaneous interpretation. Whereas simultaneous interpretation requires simultaneous and uninterrupted vocalization on the subject's behalf, consecutive interpretation is a 'silent' task in that the subject is not vocalizing during presentation of the input material but rather, silent so that he can take notes while the speaker is talking. The interpretation begins once the speaker pauses or has finished his entire speech which forcibly delays the translation process, or at least the vocalization which is not the case during simultaneous interpretation.

These and other technical differences between the tasks also complicated the design of the experiment in that the onset of recall for all conditions could not be the same, added to which two tasks were vocalized (shadowing and simultaneous interpretation) and the other two were covert (listening and consecutive interpretation). In spite of these major differences, a tentative hypothesis was put forward before testing actually began which proposed that listening be tweezed out of the hierarchy and left to stand on its own as control measure. Among the three remaining tasks, shadowing was hypothesized to be the least demanding for an interpreter, followed by simultaneous interpretation and lastly, by consecutive interpretation, simply due to the additional visual cues provided by the notes and the rehearsal involved in note-taking per se.

Since the hierarchy proposed was devised more on intuition than on empirical studies, the author then reformulated the theory by proposing a backwards approach. In other words, by measuring

the amount and quality of recall and recognition following each task, a hypothesis would then be put forth.

Further, several claims put forth by Craik and Lockhart (1972) helped develop the hierarchy in which to place the tasks along a continuum from deepest forms of processing to shallowest.

"Greater depth of processing usually implies more processing of the stimulus and thus more time is needed to carry out the subsequent operations for a deeper level of analysis". p.679

This claim enabled the author to hypothesize that simultaneous interpretation (which involves translation) would turn out to be a deeper form of processing than shadowing (which involves no translation and consequently took up less processing time on the part of the subject).

"Some stimuli are more easily processed than others. For example, pictorial stimuli may be rapidly processed to a deep level and yield a persistent memory trace whereas relatively meaningless stimuli may be processed for a longer time but yield a more transient memory trace". p. 680

This facilitated the hypothesis that consecutive interpretation (which requires the subject to make notes of the speech as it is being delivered, notes being a form of pictorial stimuli for subsequent delivery and recall) was a deeper form of processing than both simultaneous interpretation and shadowing.

"The item's meaningfulness or compatibility with the analyzing structure along with the amenability of the material will also influence the depth at which primary memory operates. In other words, if a subject's task is merely to reproduce a few words after hearing them, he need not hold them at a level deeper than that of phonemic analysis". p. 680

This final claim confirmed the hypothesis that shadowing (which involves the mere repetition of words immediately after hearing them) involved the shallowest form of processing since subjects did not seem to hold the incoming information at a level deeper than that of phonemic analysis.

Results obtained in Experiment I (Chapter II) confirmed the hypothesis put forth in that recall scores were significantly



higher following listening than following shadowing, and recall scores were significantly higher following consecutive interpretation. Interestingly enough, there were no significant differences found in recall scores following listening, simultaneous interpretation and consecutive interpretation. Similarly, as far as recognition scores are concerned, the only significant difference lay between listening and shadowing with listening yielding higher recognition scores than shadowing.

Since Experiment I had been conducted entirely in a bilingual situation in that subjects were presented with auditory stimuli in one language (French), and asked to recall in another language, English, the subjects' mother-tongue, the next logical question was whether language per se was a form of processing. This led to Experiment II (Chapter III) where the translation factor was eliminated along with one condition (simultaneous interpretation) so that we are left with three tasks that can be carried out monolingually: listening, shadowing and consecutive interpretation. Put another way, the question now asked is whether there will be any appreciable difference in the amount and type of recall when language of presentation and language of recall are the same.

Results indicated that consecutive reiteration (so named so as to differentiate this task from consecutive interpretation which is carried out bilingually) yielded recall scores that were significantly higher than those obtained following shadowing but no significant differences were found between recall scores following consecutive reiteration and listening. Generally speaking, language of presentation did not seem to affect the amount of recall in Experiment II whereas there was a clear advantage for Experiment II over Experiment I for recognition scores.

Experiment III (Chapter IV) proposed to examine the effects of note-taking on retention among conference interpreters by comparing the results obtained on recall and recognition tests following three conditions, namely listening, straightforward consecutive interpretation and an experimental consecutive interpretation where subjects were led to believe that a straightforward consecutive delivery was taking place only their notes

were suddenly removed before they had a chance to give back a consecutive interpretation. This condition was created to allow for the investigation of the possible facilitation of recall due to the act of note-taking per se. Thus, the effect of any encoding processes involved in note-taking would be isolated from the effects of external storage mechanism, that is using notes as a rehearsal device for revision or review.

Results indicated that scores obtained following consecutive interpretation with notes kept (straightforward consecutive) were significantly higher than both the experimental version of consecutive interpretation (where the notes are suddenly removed) and listening. The critical factor seems to be the rehearsal factor between note-taking and the onset of recall. If this rehearsal period is eliminated, then it appears that listening (no notes whatsoever) provides the subject with as deep a form of processing as note-taking, but on a purely external level. In other words, if one knows that no rehearsal will be allowed following a processing task, one might as well listen and attend to the message rather than risk attention-sharing activities such as note-taking which involves both listening and writing.

The fourth and final experiment (Chapter V) proposed to examine consecutive notes purely on a physical level where notes were examined as an external storage mechanism. Of the four tasks performed by interpreters in general, namely 1) attending to (i.e. listening), 2) shadowing, 3) simultaneous interpretation and 4) consecutive interpretation, consecutive seems to offer cognitive psychologists the most concrete data as to the nature of the ongoing activities carried out during complex forms of human information processing. For example, the notes taken by a consecutive interpreter may be considered as a tangible representation of the inner speech that one may be carrying out during a listening task. Judging by the scores obtained on both recall and recognition measures, consecutive interpretation involves the deepest and most intricate form of processing required of an interpreter within the depth-of-processing framework.

To recapitulate, interpreting is one of the most complex linguistic skills, a task that makes considerable demands on both the linguistic knowledge and the information-processing abilities of the interpreter. In this thesis, we examine these interpreting skills, partly because they are of interest in their own right, but chiefly because they offer a new perspective on some of the classic issues in information-processing psychology, in particular, the nature of memory and attention.

In the first chapter, we outline the basic skills required for interpreting, which can be characterized as a skill where attention is divided between at least two sub-tasks (i.e. analyzing input and constructing output), where the material has to be retained in short-term memory (and, in the case of consecutive interpretation, possibly long-term memory), and where two languages are involved (a source and a target language). This leads us first to examine recent studies of the filter theory, of divided attention and skilled performance, then to examine a currently influential characterization of the memory system (the 'depth of processing' approach) and other ideas about memory for text, in particular Kintsch and van Dijk's text grammars. Tasks normally expected of interpreters-in-training will be explained and reviewed, such as shadowing, simultaneous interpretation and consecutive interpretation. A review of the literature will present the limited number of studies carried out on simultaneous interpreters.

We then proceed to examine bilingualism and conclude the chapter by discussing the particular experimental tasks we shall be using in subsequent chapters.

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## CHAPTER I

### REVIEW OF THE LITERATURE:

From the point of view of cognitive psychology, both simultaneous and consecutive interpretation are forms of human information processing which involve the perception, storage, retrieval, transformation and transmission of verbal information. The general framework of the discussion will include a definition of the tasks involved, recent research in the psychology of attention and memory, namely shared attention and skilled performance, depth of processing, studies on bilingualism and memory for text.

### CONFERENCE INTERPRETING - THE SKILLS INVOLVED:

At international conferences where delegates do not share a common language, two types of interpretation services are normally provided: 1) simultaneous interpretation during which the interpreter translates out loud from one language into another as he listens to the source language message and 2) consecutive interpretation, during which the interpreter first listens to the source language speaker at the same time as he takes notes, subsequently delivering the oral translation of the speech once the speaker pauses or has finished his speech. Generally, simultaneous interpretation is provided at large conferences such as at the United Nations' General Assembly for example, where delegates listen to the translation of the speech in the language of their choice. At smaller gatherings, such as scientific and highly technical colloquia where delegates share one common language and where accuracy and/or secrecy are of primary importance, consecutive interpretation is usually provided.

Each type of interpretation imposes different loads on the cognitive capacities of the interpreter. It is rare for people to listen and speak at the same time. As Miller (1963) pointed out, a speaker will usually wait until the other speaker pauses before answering. In the case of simultaneous interpretation, the interpreter is able to listen to a message and speak at the

same time for periods of up to twenty minutes and more without tiring. This feat alone warrants closer examination.

Neisser (1967) mentions simultaneous interpretation in comparison to shadowing (where one simply repeats the incoming message in the same language) as evidence against a "motor theory" of speech perception:

"In a sense, simultaneous interpretation is a form of 'shadowing'. However, it is not words, or articulatory movements that are shadowed. The translator, who is obviously attending to, and understanding the incoming stream of speech, cannot possibly be imitating the speaker's vocalizations. His own vocal tract is occupied with an entirely different output". (Neisser, 1967, p.218)

In effect, simultaneous interpretation could be roughly described as shadowing, only into another language. However, the task is in fact more difficult than shadowing since the interpreter is required to transform the information presented to him auditorily in source language A, by translating it into target language B. To convey how difficult the task actually is, one has to consider the ongoing simultaneous activities: the interpreter receives and attends to part of a sentence (which will be referred to as a "chunk") (Miller, 1956); he begins translating and conveys chunk 1; at the same time, chunk 2 arrives auditorily while the interpreter is still dealing with chunk 1 orally. He cannot begin conveying chunk 2 until he has emitted chunk 1. Therefore, the interpreter must be able to hold chunk 2 in some kind of echoic store until he is ready to interpret it. Furthermore, while conveying chunk 1, the interpreter must also verify and monitor the correct delivery of chunk 1. In other words, according to Gerver (1971), the interpreter seems to be able to monitor, store, retrieve and translate source language input while simultaneously delivering a translation into target language output at the same time as he is monitoring some form of feedback of his translation since interpreters do correct themselves as they interpret.

Simultaneous interpretation has also been compared to a paced auditory tracking task (Gerver, 1971), where continuous decoding and transmission of verbal information are in operation: Adams (1961) defines human tracking behaviour in terms of a paced (i.e. time function), externally programmed input (or the source language speaker in the case of the interpreter) which defines a motor response for the operator or a verbal one for the interpreter. The control mechanism then generates an output signal which becomes the cognitive skills involved in decoding from a source language and then encoding in a target language.

Graphically, Figure 1 provides a good illustration of the complex ongoing activities during simultaneous interpretation (Moser, 1978).

If we now turn to consecutive interpretation, several explanatory remarks are in order. Consecutive interpretation may be provided in two ways: 1) continuous, where the interpreter waits until the source speaker has finished his entire speech before delivering his version; 2) discontinuous, in which the interpreter gives his delivery at appropriate breaks in the source speaker's output. In either case, during consecutive interpretation, the interpreter processes a segment of speech in source language B (French, for example), makes rapid notes into the target language A, say English. Once the speech or segment of speech is over, the interpreter delivers the translated version in target language A. It is important to note here that translation per se generally takes place as the notes are taken and not afterwards, when the interpreter actually begins to read back from his notes.

The basic skill developed by the consecutive interpreter is that of being able to take rapid notes in various forms,

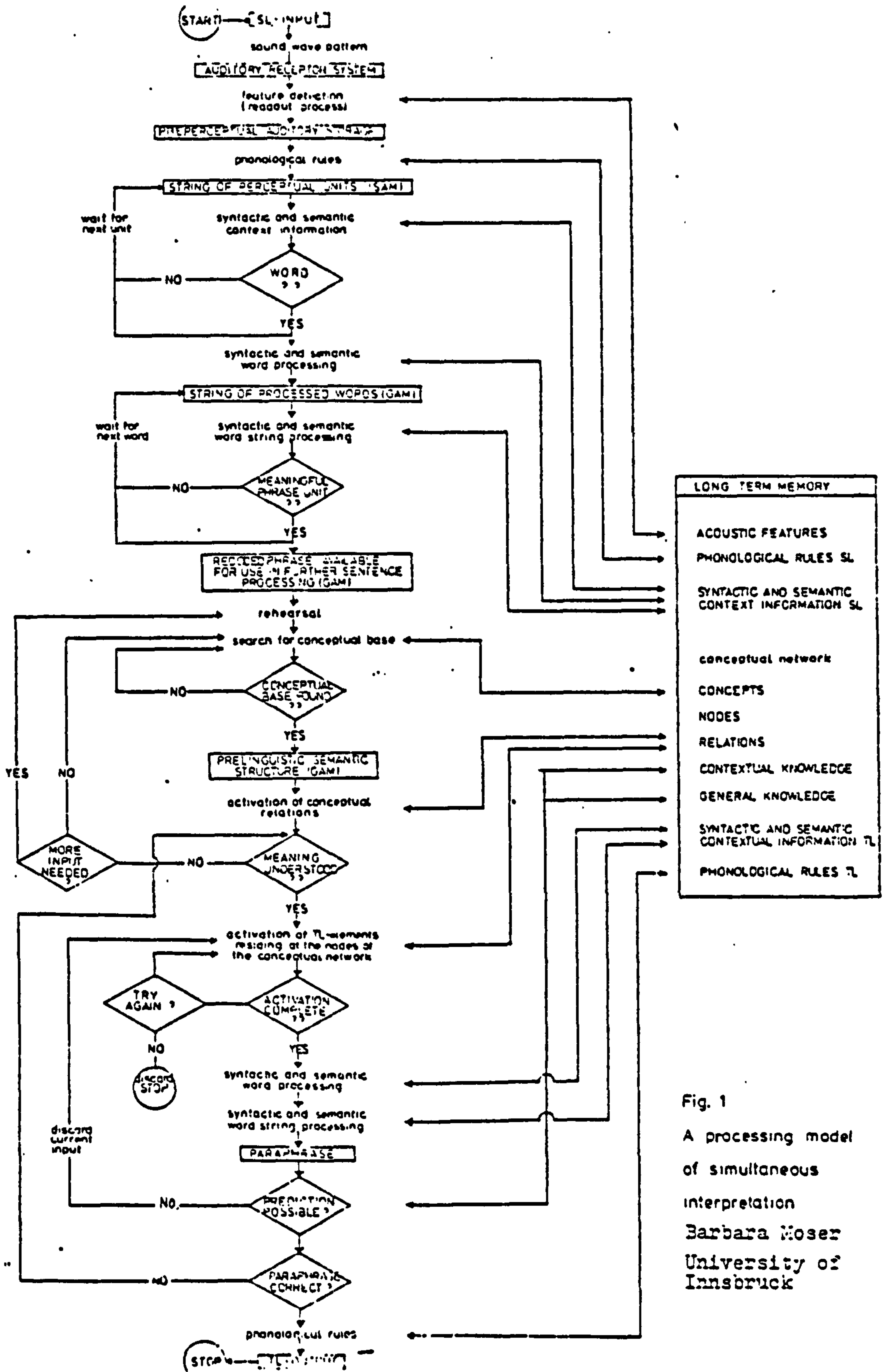


Fig. 1  
 A processing model  
 of simultaneous  
 interpretation  
 Barbara Moser  
 University of  
 Innsbruck

(words, symbols, abbreviations) and then using them as cues or mnemonic devices to reconstruct the original message in another language. These notes are highly individualized and personalized, varying from interpreter to interpreter, although some generalizations can be made at this stage.

Since a consecutive interpreter cannot possibly take down all the incoming stimuli in his notes, he retains only what he considers as salient items. He discards approximately two-thirds of the input and retains one third in his notes. Although at first glance, the notes may appear to be a graphic form of short-term memory in that the interpreter wishes to 'hold' certain items in store, it is safe to assume that some type of selection has occurred since the interpreter is unable to record everything. Furthermore, the material being processed is presented in one language and the notes are being taken in another. The consecutive interpreter must have processed the input message to a certain extent since he is being selective as to which notes he wishes to retain and which ones seem either redundant or superfluous to him. The notes serve as cues or tags when the interpreter 'reconstructs' (Bartlett, 1932) the original message and generates the translated version of the original message.

Insofar as the consecutive interpreter does not have to listen and speak at the same time, the process of consecutive interpretation may be less stressful for the interpreter than when interpreting simultaneously. Consequently, consecutive interpretation is often considered superior to simultaneous interpretation in terms of style and accuracy. The consecutive interpreter is able to deliver a stylistically more acceptable translation than would be the case for the simultaneous interpreter who must work under certain time constraints.

" In terms of the number of ongoing simultaneous activities, the more difficult of the two tasks therefore appears to be simultaneous interpretation, although no studies have examined such a theory. Interviews conducted with interpreters also



provide divergent opinions on the matter. Whether interpreting continuously or discontinuously, the consecutive interpreter always delivers his version after the original speaker's, thus providing the interpreter with the context of the message, and, more often than not, with the conclusion of the speech. In addition, since the element of simultaneity of listening and speaking is not present during consecutive interpretation, the interpreter may be devoting more of his attention to both the monitoring and the note-taking tasks, and not to the delivery of the translation which is reserved until the end of the speech. If the difficulty of simultaneous interpretation lies in the number of ongoing simultaneous activities, then 'difficulty' per se may not simply lie in the interpreter's ability to carry out complex transformations on the source language message while delivering the translation, but rather in the task of having to listen and speak simultaneously for considerable periods of time. This notion will be examined in the present research.

Studies examining the role of one's own voice in immediate memory (Crowder, 1969; 1970) compared subjects' recall following active and passive vocalization. The fact that recall following active vocalization was worse than after passive vocalization only on the early serial positions was explained in terms of a possible interference of overt vocalization with cumulative rehearsal strategies. Crowder argued that a) either overt vocalization demands more attention or time than covert vocalization or b) the paced feature of active vocalization prevented the subject from delaying categorization of elements briefly so as to allow completion of rehearsal loops.

Another explanation which may account for the difficulty of interpreting simultaneously comes from the notion that spatial and verbal information are recalled in a modality-specific manner. Brooks (1968) found that recall of verbal information is most readily disrupted by concurrent vocal activity and that

the conflict might be a result of the semantic or formal similarity between the referent and the output. Verbal recall and verbal output would conflict because they are both verbal and therefore formally similar. Although most simultaneous interpreters are never asked to recall a passage they have just interpreted, it is nevertheless interesting to note that they often claim not being able to remember the content of a speech they have just interpreted. On the other hand, consecutive interpreters are asked to recall, with the use of their notes, the entire passage they have just processed. In this study, both simultaneous and consecutive interpreters are asked to recall texts they have just processed in both modalities in order to compare their subsequent ability to recall the input material.

Shared attention and skilled performance:

- One of the most interesting questions regarding human information processing is whether a number of sensory inputs can be processed at the same time or whether the only way of coping with more than one input is to switch rapidly from one input to the other. In normal conversation, the vocalization of one speaker usually precludes that of another and therefore, people rarely talk at the same time. Miller (1963) suggests that this phenomenon may be a universal of language behaviour but that the reciprocity between talking and listening...

"... is not a necessary consequence of an auditory or physiological inability to speak and hear simultaneously; ... perhaps there is some limit imposed by agility and attention, perhaps some critical component of the speech apparatus must be actively involved in the process of understanding speech". p.417-418

An early demonstration which set out to prove the contrary was provided by Solomons and Stein in 1897. They practiced themselves at a series of progressively more difficult tasks such as reading while moving a planchette,

reading while writing dictated words, reading while writing spontaneously and reading one story aloud while copying another at dictation. They practiced each one of these tasks until one of the activities became automatic.

Neisser (1967) proposed that attention behaves very much like a filter in that some signals are "passed" for additional processing while others are rejected. The filter theory was originally proposed by Broadbent (1957; 1958) who argued that cognitive mechanisms have a finite informational capacity and that filtering mechanisms were necessary in order to avoid overloading their capacity. Broadbent's filter theory proposed that two simultaneous inputs could be processed in the sensory registration system but that beyond the filter, one input is processed first, and the second input is retrieved serially by the filter. Deutsch and Deutsch (1963) and Norman (1968) argued that two simultaneous inputs could be processed in a parallel fashion at all levels of perceptual analysis but that a 'bottleneck' controlled the entry to awareness and response selection. Treisman (1960) proposed a modification to the filter theory in that the rejected message was merely attenuated and not eradicated. Later on, Treisman (1969) concluded that divided attention and parallel processing were possible for two simultaneous inputs as long as they did not reach the same analyzers but that serial processing became mandatory whenever a single analyzer had to deal with two inputs.

Other alternatives to the filter-attenuation theory were proposed by Neisser (1967, 1969) and Hochberg (1970). Neisser, for example, argued that parallel processing was possible at the pre-attentive level only and that focused attention was unitary. According to Neisser, perception is an active process of analysis-by-synthesis:

"On this hypothesis, to 'follow' one conversation in preference to others is to synthesize a series of linguistic units which match it successfully.

.... / continued

Irrelevant, unattended streams of speech are neither filtered out nor attenuated; they fail to enjoy the benefits of analysis-by-synthesis".

(Neisser, 1967) p. 213

In early studies on attention, it appeared that consciousness could only be directed to a single activity at a time. Conscious attention to two simultaneously performed tasks was possible only if they were coordinated into a single higher-order activity (James, 1890); or attended to in rapid alternation (Paulhan, 1887; Jaffe, Feldstein and Cassota, 1967); or that at least one of the two tasks was being carried out automatically, without conscious control (Solomons and Stein, 1897) and more recently by Hirst, Spelke, Reaves, Caharack and Neisser (198

In most experiments on selective listening, subjects are usually asked to attend to one of the verbal messages by shadowing it, and to ignore the other. In most studies done in support of the single-channel hypothesis, experimental paradigms call for simultaneous attention to two closely similar if not identical tasks. Furthermore, both verbal inputs are externally generated.

Only a handful of studies have required subjects to perform two simultaneous tasks (Allport, Antonis and Reynolds, 1972; Shaffer, 1975; Welford, 1968). Allport et al. (1972) reported experiments in which subjects performed two tasks concurrently without any reduction in performance in either task: their subjects were asked to attend to and repeat back continuous speech at the same time as taking in complex, unrelated visual scenes, or even while sight reading piano music. Allport suggests that where the messages or the tasks to be performed are highly dissimilar, both tasks should be able to be performed simultaneously. The main difference between Allport's study and other experimental paradigms (Moray, 1969) is that shadowing was one of the concurrent tasks: in other words, one verbal input was externally generated.

To this effect, Allport suggests:

"... that the difficulty derives not from exceeding the limited capacity of a single general-purpose central processor, but more simply from the difficulty of keeping separate (i.e. of not confusing or confounding) two closely similar but unrelated messages".

(Allport, Antonis and Reynolds, 1972) p. 226

Shaffer (1975) <sup>found</sup> that a very skilled visual copy-typist could shadow at the same time as she was typing, without any impairment of performance. However, she had great difficulty combining auditory typing with shadowing. Shaffer suggests that interference is greater when response units rather than stimulus units are similar.

Spelke, Hirst and Neisser (1976) replicated and extended the work of Solomons and Stein (1897) by having two subjects read short stories while writing lists of words at dictation. After several weeks of practice, they were able to write words, discover relations among dictated words and categorize words for meaning while reading for comprehension at normal speed. At the beginning of the experiment, when the subjects failed to notice sentences and categories in the dictated lines, it appeared that they were copying the words without processing them to any extent. In this sense, writing might be called 'automatic'. But as the demands of the experiment changed, and after the subjects had been given additional practice, they gradually learned to analyze the dictated words semantically as well as detect simple sentential relationships between them. Finally, both subjects succeeded in categorizing dictated words with no loss of reading speed or comprehension, and, according to the authors' definition, writing was no longer 'automatic'. In a limited sense, they had achieved a true division of attention in that they were able to extract meaning simultaneously from what they read and from what they heard.

"The subjects of the Spelke-Hirst experiment were obviously attending to the dictated words as well as to the story, and not simply in an automatic way. Their performance cannot be explained by conventional theories of attention. It seems clear that the amount of information picked up from one source while attending to another is not limited by any fixed mechanisms at all, and therefore no specific hypothesis about such mechanisms can be correct. Instead, performance depends on the skill of the observer".

(Neisser, 1976) p. 92

In the Solomons and Stein (1897) experiment, where subjects practiced reading with writing dictated words, it can be argued that since their task did not involve any spontaneous generation of speech by the subjects, nor the understanding of what was heard and written, these tasks were simply not demanding enough.

The above-mentioned studies on dual task performance have provided the most difficult data for the single-channel hypothesis to handle. The single-channel theory (Broadbent, 1958) proposes that there are three components in the processing system: a selective filter, a limited capacity channel and a detection device. The sensory information storage has no capacity limitations and can accept two concurrent signals. While in this store, the signals undergo a crude sensory analysis. At this stage, a selective filter screens out all the signals which are not to undergo additional processing. Only information in the selected signal (or the attended channel) undergoes further processing. In other words, if two signals are emitted simultaneously, the sensory register accepts both stimuli; the selective filter selects one for further processing based on various features such as sensory modality, spatial location and shape. The concurrent signals are processed either serially or simultaneously by switching between the two.

A more plausible multi-channel processor can deal with two or more tasks at once provided that: 1) there is no competition between the tasks (i.e. that the tasks be dissimilar) for the use of the same channel, and that 2) subordinate channels have

• been established by sufficient practice. When, in Shaffer's experiments involving skilled typists, subjects were unable to combine auditory typing with a) shadowing, b) reading aloud or c) reciting, Shaffer (1975) suggested the three following hypotheses to account for this inability:

1. The pacing factor in auditory typing.
2. The similarity of codes in the auditory tasks.
3. The possibility that the vocal output in the other task mask the auditory typing text.

Shaffer concluded that:

"It is insufficient to assume that attention can utilize buffer stores and can deposit them in alternating output codes at a rate sufficient to maintain continuous responding in both cases".

(Shaffer, 1975) p. 158

Brooks (1968) finds that concurrent vocal activity may be the source of conflict. Crowder (1970) claims that although there may be some special advantage in receiving auditory input over a channel as familiar as one's own voice, this active vocalization may in fact make special demands on the subject which are not present during passive or covert vocalization. Jaffe, Feldstein and Cassota (1967) point out the difficulty of speaking and listening simultaneously in that although a subject may be able to attend to two voices simultaneously, he will encounter greater difficulty when one of the two voices is his own.

The automaticity factor cannot be overlooked in any discussion pertaining to simultaneous listening and speaking. A general rule appears to be that when a skill is highly learned, it gradually requires less conscious awareness or little allocation of mental effort. Furthermore, highly skilled tasks seem to become automated and thereby not susceptible to disruption by withdrawing attention (Norman, 1976). With sufficient practice, responses can become pre-attentive or are referred to

as 'automatisms' (Neisser, 1967). The notion of automaticity has also been described elsewhere by Schneider and Shiffrin (1977) as a sequence of nodes with the following properties:

"The sequence of nodes (nearly) always becomes active in response to a particular input configuration, where the inputs may be externally generated and include the general situational context. The sequence is activated automatically without the necessity of active control or attention by the subject".

(Schneider and Shiffrin, 1977)p.2

Introducing the notion of performance units, Kahneman (1973) assumes that each unit is characterized by a certain level of demands, in other words, a need for attention or effort. If these units are non-redundant and if there is no possibility of integrating them into a super-ordinate structure, and...

"... if the two performance units are incompatible, or otherwise mutually antagonistic, the effort to perform them both together will be greater than the sum of separate demands, if the organization of joint performance itself demands attention".

(Kahneman, 1973) p. 200

Kahneman adds however, that if both tasks are easy, there will be little interference. Therefore, the notion of limited capacity is no longer acceptable.

Welford (1968) discusses the simultaneous interpreter's performance within the context of a discussion of the single-channel hypothesis and states that simultaneous interpreters can, after long practice, acquire the ability to speak and listen concurrently:

"Simultaneous interpreters seem to acquire the ability to do this (speak and listen simultaneously) after long practice... ignoring the feedback from their own voices. In consequence, their speaking voices are often strange, and they themselves report that they have very little idea of what they are saying or confidence that it is correct".

(Welford, 1968)

(cited in Gerver, 1976, page 187)



Pintner (1969) examined the effects of simultaneity of listening and speaking and subjects' practice at the task on their ability of repeat sentences and answer 'yes-no' questions under three experimental conditions:

- 1) in between auditorily presented sentences;
- 2) overlapping with the presentation of these stimuli;
- 3) simultaneously with their presentation.

Her subjects included experienced simultaneous interpreters, student interpreters in their sixth semester of training, student interpreters in their first semester of training and finally, other subjects with no experience of simultaneous listening and speaking. In terms of the number of words correctly repeated or questions correctly answered, the simultaneous interpreters' performance was not significantly affected either by the task or by the condition but both simultaneous interpreters and sixth semester students performed better than the two other groups on the overlapping and simultaneous tasks. It would appear from these results that subjects with experience in simultaneous listening and speaking are able to carry out complex cognitive tasks at the same time.

Nevertheless, although experience and practice may enable a subject to perform two tasks simultaneously, it appears as though it is still considered unnatural. Broadbent (1952) for example, suggests that simultaneity of listening and speaking imposes a severe strain on human channel capacity. To avoid the strain of continuous processing in this fashion, it has been suggested that simultaneous interpreters (even with years of experience) try to make good use of the brief silence in the source language's input. To this effect, Goldman-Eisler (1968) suggested that:

"the intermittent silence between chunks of speech in the speaker's utterance is a very valuable commodity for the simultaneous interpreter:

continued .../

for the more of his own output he can crowd into his source's pause, the more time he has to listen without interference from his own output".

(Goldman-Eisler, 1968) P. 128

Poulton (1955) compared simultaneous with alternate listening and speaking and found that a significantly greater percentage of words was omitted or incorrectly repeated in the simultaneous condition than in the alternate condition. Barik (1973) investigated the notion put forward by Goldman-Eisler (1968) and analyzed the temporal characteristics of recordings of source language speakers' and interpreters' speech. Barik concluded that simultaneous interpreters do, in fact, make greater use of source language pauses than would be expected on the assumption that the interpreter's delivery is independent of intervals of speaking and pausing in the source language speaker's delivery. However, Barik also noted that source language pauses occur in between units of meaning, and since interpreters are concerned with translating units of meaning as opposed to words, they might be more likely to begin interpreting during such a pause in the source language input. Since interpreters make greater use of source language pauses, they also reduce the extent to which they have to both speak and listen at the same time, which undoubtedly represents very complex processing behaviour (Barik, 1973).

"It is apparent that in order to achieve any kind of performance level, the T has to consider units of meaning rather than perform on the basis of a more mechanical word-by-word process. It is thus more appropriate for the T to listen while the meaning unit is being formulated by S, and undertake to translate it once it is completed".

(Barik, 1973) p. 263

The depth-of-processing approach:

The presentation of a stimulus involves the rapid analysis of the incoming stimuli at a number of levels or stages. Models of human memory have attempted to define these stages or stores and examine the transfer of information among them.

The classic finding in the literature on human learning and memory is the notion that repetition facilitates learning (Ebbinghaus, 1885). Although this finding seems well established theoretically, controversies arose when trying to account for the way in which repetition facilitates learning, in that once they were formed, all stimulus-response associations were considered permanent, in spite of the fact that they were often subject to retrieval failure due to associative interference (Horton and Turnage, 1976).

"Collectively considered, the data indicated that human memory might involve 1) at least two qualitatively different systems, with one operating according to some version of trace theory and the other according to some version of association theory; 2) distinct storage and retrieval processes at both the physiological and the psychological level; and 3) complex coding of events in terms of both physical attributes (e.g. visual vs. auditory) and psychological attributes (e.g. semantic content)".

(Horton and Turnage, 1976) p. 152

Complex models of human memory then began to develop once the assumption was accepted that memory was not a unitary process.

Hebb (1949) outlined a two-factor model of multi-processing in memory, the first process known as short-term memory (STM) and the second referred to as long-term memory (LTM). STM was assumed to involve a non permanent trace of most recent events and LTM was thought to involve a more permanent structural change in the nervous system. Furthermore, Hebb proposed that memory might involve two distinctly different storage stages: memory in STM might fade if not transferred to LTM. Studies done by Peterson and Peterson (1959) and

Brown (1958; 1959) indicated that there was the possibility that the forgetting observed in their short term memory task might reflect the transient memory trace suggested earlier by Hebb (1949). Brown (1958, 1959) suggested that the material in STM would fade away over time unless some type of effort, such as rehearsal, was made to retain it.

Waugh and Norman (1965) proposed a dual-process theory of memory consisting of a primary memory (PM) and a secondary memory (SM). According to their theory, all incoming stimuli are first attended to in PM. The capacity of PM, which is very similar to that of STM, is limited in that old items are displaced by more recent items and those items which are so displaced become irretrievable. When an item is rehearsed, however, it not only remains in PM but may also accede to SM. According to Waugh and Norman, even implicit repetition (i.e. rehearsal) of an item is sufficient to transfer the item into more permanent memory.

One of the more comprehensive approaches to multiple-processing in memory has been outlined by Atkinson and Shiffrin (c.f. Atkinson and Shiffrin, 1968; Shiffrin and Atkinson, 1969). According to these authors, memory is represented in terms of three major storage systems: 1) a sensory register; 2) a short-term store; and 3) a long-term store. The general model indicates that incoming information enters the sensory register and may either be lost or transferred into other storage systems. Furthermore, various 'control processes' used to regulate the flow of information in the memory system are under the control of the individual and may be used to regulate such activities as memory search, rehearsal and response output. These control processes also depend on such factors as task instructions and past experiences of the individual. Information entering the sensory register decays and is no longer available after a brief period of time. If information entering the sensory register

is to be retained, it must be transferred into the short-term store.

Information may be retained in short-term store by means of rehearsal. Rehearsal serves to regenerate the short-term memory trace in the rehearsal buffer. The rehearsal buffer is a system with a limited capacity in that it will only hold a few items of information at a time. When the buffer is filled, the entry of new items will cause items which are already in the buffer to be displaced. The rehearsal buffer turns out to be an essential component of the short-term storage system since rehearsal provides one way by which information may be transferred from short-term to long-term memory.

Some of the objections to a multistore view of memory (Melton, 1963; Murdock, 1972; Tulving and Madigan, 1970) have encouraged an alternative framework in terms of multiple levels of information processing. For example, the notion that material learned by heart may not be recalled as well as the same material put into a more meaningful context may be explained in terms of the degree of cognitive or semantic analysis involved. A good theoretical illustration of such a theoretical approach is provided by Craik and Lockhart (1972).

Craik and Lockhart proposed an alternative to the multistore model by introducing the depth-of-processing one. They propose a series or hierarchy of processing stages through which incoming information passes. Processing begins at the bottom of the hierarchy or at a preliminary level where stimuli are analyzed in terms of sensory or physical features such as lines, angles, pitch, brightness and so on. Subsequent processing stages are concerned with such features as pattern recognition and the extraction of meaning. According to this view, "depth-of-processing" implies a greater degree of semantic or cognitive analysis at "deeper" levels in the hierarchy. Craik and Lockhart suggest that stronger and more enduring memory traces are found at the deeper levels of the analysis and they reason that since the

extraction of meaning is normally of primary concern to an individual, it is of value to store the products of these deeper levels of analysis more permanently. There is no defined limit on the amount of storage capacity available at any given level in the hierarchy, but there is a limited capacity central processor. Although it is the capacity of the central processor that is limited and not the available storage, the number of items that can be dealt with depends on the level in the hierarchy at which the processor is operating.

The limited capacity of the central processor can also be used to recirculate information at any given level of analysis. Once attention is diverted from the items, information will be lost at a rate appropriate for the level in the hierarchy at which the processor had been operating.

In the Craik and Lockhart model, it is the depth of analysis which therefore determines retention. This would appear to imply that total processing time should covary with the degree of retention. But...

"Two qualifications should be introduced here. The first is that if processing capacity is used to recirculate information at a given level, there will be no relationship between total processing time and retention. The second qualification stems from the assumption that more meaningful inputs - with existing cognitive structures (e.g. pictures or sentences) - will be more rapidly processed to a deep level than will less meaningful inputs".

(Horton and Turnage, 1976) p. 186

Thus the total time allowed for processing does not necessarily predict the subsequent degree of retention. (Craik and Tulving, 1975).

Memory is thus viewed as a continuum ranging from the short-lived preliminary analyses of speech to the more durable results of subsequent and deeper levels of analysis. Memory traces are directly correlated with the level at which the material has been processed and consequently, the rate of forgetting depends on how deeply the material has been processed. Trace persistence becomes a function of the cogni-

tive depth to which an item has been processed. Cognitive depth is defined in terms of the meaningfulness extracted from the stimulus...

"... since the organism is usually concerned only with the extraction of meaning from stimuli, there is little need for the products of preliminary analyses to be stored in memory. Thus it seems reasonable to speculate that the products of early physical analyses are very transient, while the products of later, more semantic analyses are stored so that the organism may profit by the experience and modify its future actions accordingly".

( Craik, 1973) p. 49

In addition, there are several factors that lead to deeper processing and thus to better recall:

- 1) Greater depth of processing usually implies more processing of the stimulus and thus more time is needed to carry out the subsequent operations for a deeper level of analysis.
- 2) Some stimuli are more easily processed than others. For example, pictorial stimuli may be rapidly processed to a deep level and yield a persistent memory trace, whereas relatively meaningless stimuli may be processed for a longer time but yield a more transient memory trace.
- 3) The item's meaning-fulness or compatibility with the analyzing structure along with the amenability of the material will also influence the depth at which primary memory operates. In other words, if a subject's task is merely to reproduce a few words seconds after hearing them, he need not hold them at a level deeper than that of phonemic analysis.
- 4) the amount of processing or attention directed at the stimulus.

Atkinson and Shiffrin's approach (1968) differs from Craik and Lockhart's (1972) in that the former emphasizes both multiple-storage systems and 'control processes' which

are employed to regulate the flow of information, whereas the latter processes incoming information to different levels of analysis instead of being transferred to different storage systems. All of these models share the assumption that some version of multiprocessing theory is preferable to a single-process model of memory and assume that attention is an important factor in the processing, storage and retrieval of information.

Several drawbacks regarding the major prediction of the levels approach - that retentivity should be a positive function of processing depth - have arisen because of the absence of an independent index of depth.

"What could 'depth' actually measure? Is it related to the sequential order of the processing stages through which a stimulus is analyzed? Or to the temporal order in which different representations of that stimulus become available? Or to the sheer amount of processing? Or to its degree of semanticity? Or is depth logically defined, quite independently of psychological processing, in terms of the level of abstraction or of complexity of the units of description? If all these measures coincide, we are in the happy position of being able to use them interchangeably; however, people have tended to assume this without offering much evidence for it. Thus, before attempting to investigate levels of processing, we need to clarify their definition".

(Treisman, 1979) p. 302

Eysenck also proposes that processing depth is simply related to processing effort, and, should this be the case, there are a number of measures of processing effort that might reflect depth of processing.

One of the major claims proposed by Craik and Lockhart was that 'trace persistence is a function of depth of analysis, with deeper levels of analysis associated with more elaborate, longer-lasting and stronger traces' (Craik and Lockhart, 1972, page 675). But it is now clear that the



degree of empirical support for this hypothesis depends heavily on the nature of the retrieval environment (Bransford, Franks, Morris and Stein, 1979). Moreover, as Eysenck (1978b) has noted, although Craik and Lockhart argue in favor of the encoding specificity principle, 'the hypothesis that deeper levels of analysis lead to strong traces is logically inconsistent with the encoding specificity principle since the hypothesis contains no reference to the conditions of retrieval' (Eysenck, page 177). Finally, there is a considerable problem in distinguishing among the closely related concepts of trace depth, trace elaboration and trace distinctiveness (Eysenck, 1979).

Recent critics of Craik and Lockhart's proposals have commented on the fact that depth has not been defined independently of its memorial consequences and until it is, it will remain a circular and unhelpful concept.

"In other words, as the subject moves from one level of analysis to another, the amount of relevant past learning and compatibility with analysing structures will change, and therefore the experimenter cannot know to what extent observed effects on the dependent variable are, due to depth, to breadth, or to interactions between them. In short, there is no way in principle that Craik and Lockhart's (1972) major proposal can be tested".

(McCullough, 1979) p. 458-459

Baddeley (1978) argues that recent evidence goes against the notion of a simple hierarchy of processing stages of the type implied by Craik and Lockhart. Recent findings by Marcel (Marcel and Patterson, 1978) in which dependent variables such as the time required to make a lexical decision were affected by the meaning of previously presented masked stimuli; semantic analysis had occurred in a situation in which subjects were unable even to detect the presence of the words, let alone recall them.

Studies on bilingualism:

Defining bilingualism has not met with unanimous agreement. Some definitions are stricter than others. For example, Bloomfield (1933) would only label as bilingual, individuals who had a complete or native-like competence in both languages. On the other hand, Haugen (1953) and Macnamara (1967) attribute the label to any individual who shows even minimal competence in a second language. Macnamara (1967) starts from the premise that an educated person possesses two production or encoding skills (that is speaking and writing) along with two reception or decoding skills (listening and reading). In each of these skills, the phonological, lexical, syntactic and semantic aspects are involved, thus providing us with a complete matrix of four aspects of each of the four skills. According to the author, bilingualism...

"... involves two such matrices or, because not all individuals possess all four skills, at least sections from two such matrices".

(Macnamara, 1967)P. 59

To differentiate among bilinguals even further, some distinction has been made according to the language used and to the contexts in which the languages were either acquired or are used. This distinction among bilinguals is that between coordinate and compound bilinguals. This distinction was brought to the attention of psychologists principally by Weinreich (1953) and further elaborated by Erwin and Osgood (1954). The coordinate-compound distinction refers essentially to the semantic aspects of language: compound bilinguals are those who attribute identical meanings to corresponding words and expressions in their two languages. This semantic fusion is said to have resulted from having learned both languages in the same context (in a bilingual home, for example), or one language through the medium of the other (known as the indirect method). On the other hand, coordinate bilinguals are those indi-

viduals who derive different or partially different meanings from corresponding words and expressions in their two languages. The distinction in the coordinates' meaning systems is said to arise because they acquired their languages in different contexts.

Further, individuals who learn both languages at the same time and/or in the same context (infant-compound bilingualism) are different from individuals who learn the second language after the first one has been mastered (children or adolescent compound bilinguals) in terms of results obtained on language-testing.

But, in this study, we are not concerned specifically with the measurement of bilinguality. Suffice it to say that the subjects used in this experiment were all coordinate bilinguals in that they had acquired their second and, in some cases, their third languages once the first language had been mastered. Further, since interpreters are rarely required to interpret into a language other than their mother-tongue, it would be safe to borrow Weinreich's label of 'subordinate bilinguals' (1953) in that for these individuals, one language is more dominant than the other. More pertinent to the present study is the influence - if any - of presenting stimuli in language B and having subjects recall in another language, language A, their dominant language. When language of presentation differs from language of recall, will there be any difference in the type or amount of recall? When language of presentation and language of recall are the same, will the subject recall more than when they are different?

Having two languages implies that the individual also has two sets of phonetic, lexical, syntactic and possibly two sets of semantic rules (Macnamara, 1967). The question therefore arises as to whether the bilingual's languages are independent or interdependent. Specifically, we will examine the psycholinguistic independence-interdependence in terms of the input-output mechanisms - how the interpreter is able to keep his language separate during input (listening) and during output (speaking). One possible answer was

provided by neurosurgeons Penfield and Roberts (1959) who proposed the theory that a bilingual's two languages are functionally separate in that when one is switched on, the other must be switched off. To test this theory, Preston (1965) used the bilingual version of the Stroop Colour-Word Test (1935). Briefly, in the monolingual version of this test, the subject is presented with a list of names representing different colours (red, blue, green, etc), printed in coloured ink which does not correspond to the colours named. For example, the word red is written in blue ink. The subject's task is to ignore the colour names and to identify the colours of the ink. As expected, subjects show interference by calling out the colour names by the word rather than by the colour of the ink. In the modified bilingual version of the Stroop-Colour Word Test (Lambert, 1953), the subject is given lists of colour words in each of his two languages, on separate occasions, and is required to label the colour of the ink and ignore the colour names. On one occasion, the subjects respond in one language and, on another, in the other language. It is therefore possible to determine the subject's dominant language by comparing the time it took him to identify the words when they are compatible with the language of response and when they are incompatible. Each subject's time to complete the task was taken under four conditions:

- English input and English output;
- English input and French output;
- French input and French output;
- French input and English output;

Performance times were also taken for control conditions in which colours were used but where the words were not printed in colour. Preston (1965) found that times for the experimental conditions (i.e. colour words) were significantly longer times under the control conditions. However, there was little variation among the times under the four experimental conditions. These findings are

interpreted as evidence against Penfield and Robert's theory (1959) because, according to Macnamara (1967):

"... since the theory would predict that when subjects were set to respond in  $L_1$ , the  $L_1$  system would be on and the  $L_2$  system off. In that case, subjects ought to have had no difficulty in ignoring stimuli in  $L_2$ , and their times ought to have been the same as if they were merely naming patches of colour. The findings, however, were to the contrary".

(Macnamara, 1967) p. 67

Macnamara then proposed a more complex theory of functional separation in terms of a two-switch model against the single-switch model of bilingual functioning implied by Penfield and Roberts. In order to validate the two-switch theory of functional separation and of linguistic independence, including separate investigations of the hypothesized output switch, input switch and the two combined are required.

To this effect, Kolers (1966) examined the performance of bilinguals when asked to read and spontaneously produce passages where two languages were mixed. He found that speeds for reading and spontaneous production were much slower although comprehension was not affected. Macnamara (1967) had bilinguals say as many individual words as possible in a given time period while alternating from one language to the other but without translation. It was found that under this condition, performance was significantly poorer than under conditions where subjects presented words monolingually in either one of their languages.

In other studies, Kolers (1965, 1966) and Lambert, Ignatow and Krauthammer (1966) examined the free recall of bilinguals for three types of word lists: monolingual word lists in one language in the other language and linguistically mixed lists. Subjects were asked to recall the items in the same language as that of presentation. Results indicated that subjects recalled items

from linguistically mixed lists as well as from monolingual lists with few translation errors. Kolers (1966) found that the repetition of the translated items was as beneficial for recall as repetition in the same language, thus suggesting that subjects store the items in a non-linguistic semantic store.

Treisman (1964) found that bilingual subjects who were shadowing a message in one language presented to one ear through one headphone were unable to ignore a simultaneous competing message presented to the other ear, through the other headphone and in another language. Another study carried out by Treisman (1965) is of interest in that she went beyond the mere translation of words by asking her subjects to translate entire sentences, something which is more relevant to the present study. Treisman examined the speed with which bilinguals could carry out simultaneous interpretation from English to French and from French to English by measuring the extent to which her subjects lagged behind the incoming message. Results indicated that the extent of the lag was determined by the amount of information in the incoming message. Furthermore, she found that translation took more time than shadowing, although her subjects varied in their degree of bilinguality. She did find, however, that translation from English into French was consistently faster than translation from French into English which would suggest that there is something about English which makes it easier to decode than French, or something about French which makes for easier encoding.

Treisman also showed that if the distracting message has the same general characteristics as the shadowed message but is a translation into a foreign language, bilingual subjects can detect the identical meaning of the messages.

Memory for text:

There seems to be a paradox in the research presently being carried out on human memory: people usually make use of their language abilities in the form of sentences but the important body of research literature on human verbal learning seems to focus on parameters involving free recall or words, nonsense syllables or series of digits. Assuming that sentences and prose passages are better remembered than strings of unrelated words (Reynolds and Flagg, 1977), the next question which comes to mind is how prose is stored in memory.

In order to explain both the success and the failure of memory, one approach has been that of trace theories which lay emphasis on changes in memory storage over periods of time. The basic notion is that the effects of learning or practice remain in the form of a memory trace after active practice or learning have stopped. Another view of verbal memory was put forward by Sir Frederic Bartlett (1932) in Remembering, where he was concerned with providing a description of the complex mental processes he felt were involved. Bartlett maintained that people retain only those aspects of the stimulus that are important to the individual, or certain 'key information'. What constitutes this 'key information' depended on the context, both linguistic and physical, in which the stimulus was presented. Furthermore, memory representation could be supplemented by information from both the stimulus material and from general knowledge of the world. In Bartlett's own words:

"It is an imaginative reconstruction, or construction, built out of the relation of our attitude towards a whole active mass of organized past reactions or experience..."

(Bartlett, 1932) p. 213

Subjects are unable to reproduce texts verbatim after one presentation, nor are they able to reproduce all the propositions of a text when these are longer than a few words (van Dijk, 1977). Before examining the mental operations that may be involved in text comprehension and recall, one must begin by examining the input text, sentence by sentence, specifying the processes undergone in comprehension. Since memory for sentences and for text is usually semantic (Sachs, 1967), the present study intends only to deal with semantic structures.

Kintsch (1974) and van Dijk (1972, 1977) attempted to characterize the semantic structure of a discourse in terms of an abstract text base. They began with the assumption that the surface structure of a discourse is interpreted as a set of propositions, ordered by various semantic relations among the propositions. Some of these relations are explicit and some are inferred during the interpretation process. The semantic structure of a text is characterized at the level of the microstructure and macrostructure. Kintsch and van Dijk (1975) define micro- and macrostructures as follows:

"The microstructure is the local level of the discourse that is, the structure of the individual propositions and their relations. The macrostructure is of a more global nature, characterizing the discourse as a whole. These levels are related by a set of specific semantic mapping rules, the macrorules".

(Kintsch and van Dijk, 1975, p. 101)

The general abstract nature of the macrorules is based on the relation of semantic consequences in that they must preserve both truth and meaning. Some macrorules are 1) deletion, where each proposition that is neither a direct nor an indirect interpretation condition of a subsequent proposition may be deleted; 2) generalization, where each sequence of propositions may be substituted by the general proposition denoting an immediate



superset, and 3) construction, where each sequence of propositions may be substituted by a proposition denoting a global fact of which the facts denoted by the microstructure propositions are normal conditions, components or consequences (for details, see van Dijk, 1975).

The propositional notation represents the meaning of a text by means of a structured list of propositions, which are composed of concepts. Each proposition includes a predicate or relational concept, along with one or more arguments (Kintsch and van Dijk, 1978). The arguments of a proposition fulfill different semantic functions, namely agent, object and goal.

Recalling the propositions constitutes new texts, not necessarily replicas of the original input since they will consist of reconstructively added details, explanations and other various features.

"Transformations may be applied at the level of microstructure, the macrostructure, or the schematic structure. Among these transformations, one can distinguish reordering, explanation of coherence relations among propositions, lexical substitutions and perspective changes. These transformations may be a source of errors in protocols, too, though most of the time they preserve meaning. Whether such transformations are made at the time of comprehension, or at the time of production, or both, cannot be decided at the present".

(Kintsch and van Dijk, 1978). p. 375

When reproducing the input text, a subject's memory contains several memory traces: a) traces from various perceptual and linguistic processes involved in text processing; b) traces from the comprehension processes; and c) contextual traces. When reconstructing, and when micro- or macro-structures are no longer retrievable, the subject usually tries to reconstruct the information by applying rules of inferences to any information that is

still available. Kintsch and van Dijk propose three reconstruction operators;

- a) addition of plausible details and normal properties;
- b) particularization;
- c) specification of normal conditions, components or consequences of events (Kintsch and van Dijk, 1978).

Studies of memory for prose require the ability to represent the meaning of texts in terms of their most relevant aspect: their semantic content. The model proposed by Kintsch (1976) represents the meaning of a text by text bases consisting of lists of propositions. Propositions are n-tuples of word concepts formed according to a set of rules which are part of a person's semantic memory. In this context, semantic memory is synonymous with a person's 'knowledge of the world'. When remembering a text, a story or a novel, a person does not remember proposition lists as such but rather a summary of the story, supplemented at certain points by the more detailed type of propositional information. When a reader recalls a story, this abstract provides him with a sort of framework by means of which he can organize the bits and pieces of detailed information still available and from which he can reconstruct other parts of the story. No representation of the meaning of texts can be satisfactory unless it provides an account of the overall structure of the text.

Recall of information is not only reproductive but reconstructive (Bartlett, 1932; van Dijk, 1980). The reconstructive nature of retrieval processes may result in different transformations of information with respect to input information and/or with respect to discourse representation in episodic memory. Some of the transformations may already take place in the comprehension phase of information processing. In that case, the transformed structures are already part of the representation,

Transformation during comprehension in general depends on the various factors of the cognitive set and takes place in the construction of coherent representations which must be as consistent as possible with our knowledge of the world fragment the discourse refers to. Retrieval transformations may take the following forms:

- a) deletion: information is left out because it is assumed that it was not in the original text or because it is thought to be irrelevant for reproduction;
- b) addition: information is added because it was assumed to be in the original text, because it would make the text more coherent or more 'logical';
- c) permutation: the order of information is changed because the original order is assumed to be less coherent or because new ordering is thought to be better understood in the reproduction;
- d) substitution: information units are substituted for other information units also because the new unit is assumed to be more coherent or better understandable;
- e) recombination: information elements are recombined in other units;
- f) level shift: information high in the hierarchical representation is downgraded and/or low information is upgraded (e.g. due to new knowledge or other cognitive set factors about the relevance of information).

These transformations in principle allow that the resulting reproduction of a text is different from the information in the text. In principle these transformation account for most of the variation in recall protocols, given an assumed text representation in episodic memory. (van Dijk, 1980) p. 261-262.

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Shadowing:

The shadowing technique, which involves the immediate vocalization of auditorily presented speech stimuli, is frequently used as a means of studying selective attention in man since it provides the experimenter with some evidence that the subject is attending to the message when shadowing. One of the first experimenters to use the shadowing technique was Colin Cherry (1953) who found that when a subject shadows a message presented in one ear, he is apparently unaware and oblivious to the message presented to the other, unattended ear. With regard to the shadowed and attended message which concerns us more in this study, Cherry found that the subject remembered very little of the shadowed message in spite of the fact that he had recognized all the words during the shadowing task. So, although the appropriate message can be shadowed accurately, little seems to be retained of its informational content.

According to Waugh and Norman (1965), when one channel of information is being attended to, very little information is retained about the properties of the other, unattended channel. Norman adds that:

"One marked characteristic of the subject's speaking voice is its monotony. Very little emotional content or stressing of the words occurs at all... he may have very little idea of what the message he has repeated is all about".

(Norman, 1976, p. 18-19)

Since the shadowing technique involves the overt vocalization of a message, the first question to be considered is whether or not shadowing yields higher retention than simple listening.

Murray (1965) examined the difference between overt and covert repetition of consonant letters and their subsequent effect

on recall of these consonants. When no noise was present, he found that recall increased with vocalization. Murray proposed that the more active the rehearsal between presentation and recall, the greater the facilitating effect upon recall. Although Murray's experiment may shed some light on part of the present research (i.e. the rehearsal involved during consecutive note-taking) with his reference to the fact that active rehearsal improves recall, we still cannot infer that shadowing will necessarily lead to better recall than simply listening to a text. With regard to shadowing, there may be some controversy as to what rehearsal consists of and how it could be measured. When a subject shadows without understanding (Chistovitch, Aliakrinskii and Abilian, 1960), shadowing may then be labeled as mere repetition and not necessarily as active rehearsal. In their experiment, Chistovitch et al. found that when subjects chose to shadow without understanding, they gave accurate phonemic reproductions of speech sounds at very short latencies (150 to 250 milliseconds) but could not subsequently recall the material they had just processed. Those who shadowed with understanding, on the other hand, repeated the speech at longer latencies of 250 milliseconds and up. Other studies, however (Marslen-Wilson, 1975) have shown sophisticated correction by shadowers of error during shadowing.\* Norman (1976) also differentiates between phrase and phonemic shadowing in that when phrase shadowing, the words are slightly delayed behind those of the input, where the lag is long enough to take advantage of the language but not so long as to impose a memory burden on the shadower. In phonemic shadowing, the subject is asked to repeat each sound as he hears it, without waiting for the completion of the input phrase, or, in some cases, even for the completion of a word. The lag involved in phrase shadowing implies that there is a grammatical analysis of the material processed which may be reflected in the amount of recall of the messages shadowed one way (phrase) or

\* So the Marslen-Wilson work shows that even at short latencies, shadowers are doing more than "phonemic" shadowing.

the other (phonemic shadowing).

This differentiation between phrase and phonemic shadowing must be considered: if phonemic shadowing is mere repetition and not an active, overt form of rehearsal, recall after phonemic shadowing is likely to yield different results from that following phrase shadowing. Mere repetition seems to have little if any influence on the recall of individual items (Corballis, 1969). Glanzer and Meinzer (1967) label this form of repetition as "circulation" which simply serves to maintain an item in short-term store and which may also reduce the chances of its entering into longer-term store.

"If repetition is identified with 'circulation' and is distinct from 'learning and organizing' then two things follow: a) since repetition is identical with or similar to the activity that maintains the word in short term store, repetition should have little or no detrimental effect on words held in long term store (i.e. little or no effect on the end of the serial position curve); b) since repetition is, by hypothesis here, not similar to the activity that places the word in long-term store, then it would interfere with this activity and depress the probability that a word will enter long term store".

(Glanzer and Meinzer, 1967) p. 932

Mackworth (1964) found that vocal repetition of the message by her subjects during presentation actually reduced recall, or, in some way, interfered with recall.

But consider more recent experiments which indicate that syntactic and semantic information from the entire sentence may be operative for successful shadowing. Using mixed sets, Miller and Isard (1963) found that normal sentences were better shadowed than nonsense sentences, which, in turn, were more easily shadowed than scrambled nonsense sentences. Treisman (1965) found that subjects shadowed with less error as the material approached normal

English. In an earlier experiment, Treisman (1964) also presented two different stories dichotically and asked her subjects to shadow the material reaching one ear. Partway through the experiment, she interchanged the messages between ears. The subjects repeated some of the words from the wrong ear, words which continued the message previously shadowed. In other words, the sort of contextual predictability that was important in Treisman's experiment seems to be essential for successful shadowing. Rosenberg and Lambert (1974) found that while shadowing connected discourse, subjects seem to use the relations between sentences, in other words, the contextual cues found in connected discourse. Shadowing and recalling connected discourse may yield results that may be more applicable than shadowing phonemes, digits, words or even isolated sentences, especially when the subjects involved are conference interpreters.

Other experiments (Moray and O'Brien, 1967; Shaffer and Hardwick, 1969) have abandoned the shadowing task and subjects were simply instructed to listen to, or monitor a message. Hochberg (1970) distinguishes between monitoring and shadowing in that monitoring is essentially a passive task and the listener requires little effort to fully analyze the components. During shadowing, however, the subject has his information processing capacity taxed to a much greater extent than in the monitoring situation. Furthermore, the shadower's own voice, absent during monitoring, may act as a third signal source, causing interference with the perception of the incoming messages, thus possibly discrediting the reliability of the shadowing technique as a reliable way of 'locking' one's attention. Norman (1969) argues that the difficulty of performing the shadowing task precludes the possibility of rehearsal, thus minimizing the longer term retention of the shadowed material. In experiments undertaken with highly practiced shadowers, Underwood (1974) hypothesized that they would not be constrained by the

processing requirements of the shadowing task and would therefore be able to process as much information from the available sources of stimuli as would a subject not shadowing. His results indicated that the only reliable performance increase demonstrated by the practiced subjects over unpracticed subjects was in the number of detections of unattended digits while shadowing.

Underwood and Moray (1971) compared detection of digits in the context of letters when the targets were in the attended and unattended ear, and when the subject shadowed one ear or when he simply attended to the input without making any overt response. Detection of attended targets was higher than detection of unattended ones and the detection of both attended and unattended targets was higher when the subjects monitored than when they shadowed. In an experiment where the same message was presented in both ears but where one message lagged slightly behind the other, Treisman (1964) found that both the attended and the unattended messages were stored for shorter periods of time when the subject shadowed than when he simply monitored the message.

Is shadowing more effective than monitoring in locking the subject's attention onto the shadowed item? Could it be that the act of vocalization may be providing the auditory and motor feedback necessary to store the shadowed items in short-term store? Does shadowing increase the amount of attention given to the message or does it decrease it? Baddeley (1976) claims that during selective attention, the attended message receives deeper processing in that the attended message is repeated and therefore is heard twice and spoken once by the subject. In an experiment designed to clarify the effects of shadowing on both the shadowed and the non-shadowed messages, Lewis, Honeck and Fishbein (1975) found that, relative to simple listening, shadowing actually decreased the number of targets detected on the channel to which subjects attended. Furthermore, they questioned the ability of shadowing



as a means of locking an individual's attention.

"Performance on the shadowed channel is far better than on the non-shadowed channel, not because more attention is diverted to the shadowed channel but rather because less attention is detracted from it. It is probably incorrect to consider shadowing as a means of locking attention onto the shadowed channel; instead, the technique ought to be considered as a means of differentially unlocking attention from both channels".

(Lewis, Honeck and Fishbein, 1975) p. 458

What effect does shadowing have on comprehension and recall of input material? Carey (1971) found that shadowing did not hinder understanding in an experiment in which subjects either listened to, or shadowed prose. The passages were recorded at 1, 2 or 3 words per second, and after the experimental task, subjects were given tests of word and syntax recognition as well as semantic retention. Shadowers' word recognition and semantic recognition scores were somewhat higher than those for listeners at the slowest rates but these differences disappeared at faster rates. Simultaneous listening and speaking did not preclude understanding and recall in a relatively simple shadowing task. Carey went on to propose the "shadowing facilitation hypothesis" which predicts that the extra psycholinguistic processes required in successful shadowing result in higher retention scores than simple listening. Insofar as shadowing is successful, and the shadowing response that a subject monitors identical to the input, shadowing will have a facilitating effect on retention.

Gerver (1974) asked conference interpreter-trainee subjects to a) listen to, b) shadow, and c) interpret simultaneously into English, three French prose passages. Subsequent tests of comprehension and recall showed that higher scores were obtained after listening than after simultaneous interpretation, which in turn, yielded significantly higher scores than following shadowing.

Since the test scores were higher after passive listening than after both simultaneous interpretation and shadowing, it would appear that the simultaneity of listening and speaking present during shadowing may have impaired comprehension.

Gerver's results demonstrate that simultaneous listening and speaking can impair recall of the material listened to while speaking. They also show that such recall is better when complex information processing is an integral part of the simultaneous listening and speaking than a relatively simple form of processing is involved (Gerver, 1974). Although, as Carey (1971) demonstrated, analysis of meaning can occur while shadowing, simultaneous interpretation involves a compulsory analysis of source language deep structure of the target language. Shadowing, on the other hand, involves a less complex transformation of the message from the auditory to the vocal mode in which analysis of meaning may be incidental rather than an integral part of the process.

"It could be objected that the difference in recall between shadowing and interpreting might be due simply to the different demands placed on speech output by the two tasks; almost continuous speaking being required in shadowing but only intermittent speaking in simultaneous. In other words, recall after shadowing might be poorer because the shadower spends more time in simultaneous listening and speaking than the interpreter".

(Gerver, 1974, p. 340)

Simultaneous interpretation:

A detailed account of the process of simultaneous interpretation was provided by Moser (1978) which, in turn, was based on an analysis put forth by Massaro (1975). The source language message is first received in the auditory receptor system where it becomes available for further analyses. The information gained is then stored in the perceptual auditory storage. At this stage, a primary recognition process based on the phonological rules of the source language synthesizes those acoustic features into a synthesized percept or syllables which is stored in synthesized auditory memory. Secondary recognition transforms the sequence of synthesized syllables into words where syntactic and semantic cues are necessary for word recognition to occur. The information now available for further processing is the string of processing words. Information is now temporarily stored in what is termed 'generated abstract memory' or GAM, an equivalent of short term memory in other literature. It is at this stage that verbal information is temporarily stored, where continuous recoding and rehearsal processes makes incoming information available. Information is chunked (Miller, 1956) into more abstract units which combine the essentials of meaning of the smaller chunks or units that are being recoded. Syntactic and semantic information play a dominant role in this process. The information is now stored in LTM where it can be referred to at any given moment during the processing stage.

Another cognitive definition of the nature of the task involved is provided by Karmiloff-Smith (1978):

"... the interpreter while listening to a speaker is constantly updating his mini-theory of the speaker's semantic intentions. Each speech act is not only the communication of new information but the intricate interplay of new information and presuppositions based on the knowledge accumulated from the present discourse and on general extralinguistic knowledge".

(Karmiloff-Smith, 1978) p.379

Most of the literature concerned with simultaneous interpretation seems to concentrate on the unusualness of the task (see Gerver, 1975). Simultaneously processing two languages, both source and target, is an unusual occurrence: having to anticipate the semantic and syntactic form of the incoming message without necessarily being able to wait for the end of the speaker's source sentence; the need to be acquainted with the subject material of the conference beforehand.

Karmiloff-Smith (1978) draws an interesting parallel between processing which occurs in monolingual situation when a child is acquiring his first language, and the dual processing involved during simultaneous interpretation. Simultaneous processing of two different symbolic modalities is frequent. Furthermore, the ability to anticipate a speaker's message is part of normal dialogue. Schank (1976) and Charniak (1972) have shown how the understanding process does not rely simply on the words in the discourse but on the hearer's general knowledge about the topic. To be able to infer essential elements which have not explicitly been stated in the message, hearers rely on situation 'scripts' - 'scenarios' or 'frames' (Minsky, 1975). Bransford and Johnson (1972), Dooling and Mullet (1973) have clearly shown how a subject's understanding depends not only on what he hears but on the implications of received information according to the knowledge he already possesses. Chernov (1973) illustrated how interpreters 'get lost' if prior information and received information are incompatible.

Simultaneous interpretation could be crudely described as shadowing into another language. However, the task is more demanding than shadowing in that the interpreter is required to transform the information presented to him auditorily in source language A by translating it into target language B, as opposed to merely repeating it, as would be the case for the shadower.

Although very little research has been carried out on the topic of simultaneous interpretation, especially by authors on

human skills or cognitive psychology, the few exceptions will be mentioned here. Welford (1968), basing his assumption on the supposition that attention can only be paid to one activity at a time, suggests that simultaneous interpreters acquire the ability to listen and speak simultaneously after long practice, by ignoring the sound of their own voices. Neisser (1967) limits his mention of simultaneous interpretation as evidence against a motor theory of speech perception.

The first experimental studies appeared in 1965 with Oléron and Nanpon, and Anne Treisman. Oléron and Nanpon (1965) studied ear-voice span from recordings of a number of simultaneous interpreters and found that delays could range from 2 to 10 seconds, depending on the relative difficulty of organizing the incoming material. Because of the limitations of short-term memory, Oléron and Nanpon suggested that interpreters could not afford to lag too far behind the input speaker. Treisman (1965) examined the speed with which bilinguals could perform simultaneous interpretation from English into French and vice versa, and she measured the extent to which her subjects lagged behind the incoming message. She found that the lag was principally determined by the amount of information in the incoming message. Furthermore, Treisman found that translation was slower than repetition in the same language (i.e. shadowing). In addition, grammatical constraints were more important than semantic ones in shadowing than in interpreting. Treisman attributed the greater ear-voice span for interpreting than shadowing to:

"... the increased decision load imposed by the more complex transformations between input and output".

(Treisman, 1965, p. 376)

Goldman-Eisler (1967) examined the role of patterns of speaking and pausing in simultaneous interpretation and found that pausing contributed at least 30% of the total time spent in speaking and

pausing. In previous papers with Henderson and Skarbek (Henderson et al., 1965, cited in Gerver, 1976), Goldman-Eisler suggested that periods of long pauses and short speech bursts alternate with periods of short pauses and long speech periods, and that this repeated pattern reflects cycles of acts of planning and production in speech.

Barik (1973) examined both the temporal and qualitative properties of simultaneous interpretation in relation to three independent variables: 1) the type of material to be interpreted; 2) the level of expertise of the interpreter; and 3) the direction of translation - that is whether the subject is interpreting from his dominant language into his weaker one, or vice-versa. Among other things, Barik found that the interpreter makes good use of the speaker's pauses to deliver his interpretation. Furthermore, the interpreter characteristically lags behind the speaker by 2 to 3 seconds but tries to take advantage of the speaker's pauses and thereby try and reduce the time during which he must both listen and speak at the same time.

The temporal data did not reveal, in general, any striking differences in relation to the different categories of interpreters, the various types of material, or the two directions of translation.

However, in the content analysis, less qualified interpreters omitted more material and made more translation errors than the more qualified interpreters. Their translations were also much more literal. The more professional interpreters performed as well in either direction, whereas the less qualified ones performed better when working from their dominant language toward their weaker one. Finally, Barik found that the longer the interpreter lagged behind the speaker, the more he was likely to omit. On the other hand, if the interpreter remained too 'close' to the speaker, he then ran the risk of making translation errors.

Barik's content analysis (1972) included the various types of departures noted in the interpretation relative to the original texts:

1) the 'additions' of translation constituted the first group. These additions are made up of inclusions in the interpreter's version of material not present in the original, the majority of which consist of slight elaborations on the text such as the addition by the interpreter of a qualifier or qualifying phrase. Other additions are made in association with disruptions in the translation but Barik noted that, in general, very little material was added to the text by the interpreter. He did note that there was a slight tendency for the more qualified interpreters to add a bit more material than the less qualified ones who tended to be more literal in their translations.

2) the second category proposed by Barik was 'omissions of translation', which relate to material in the original version and not translated by the interpreter.

Errors of translation refer to segments of text which are inappropriately translated by the interpreter which can range from relatively minor errors to gross errors involving a single word or concept or a whole phrasing unit.

The most extensive research on simultaneous interpretation seems to have been carried out by Gerver (1969; 1971; 1972a; 1974 a; 1974b ). Gerver examined the performance of simultaneous interpreters when shadowing and interpreting under noise-free, moderately noisy and extremely noisy conditions. Results indicate that although more was omitted in both shadowing and interpreting as noise increased, significantly more errors were made in interpretations than shadowing under both moderate and very noisy conditions. In addition, ear-voice spans remained constant under all conditions, that is, greater for interpreting (approximately 5.7 words behind the speaker) and for shadowing (approximately

2 words). But further analyses of the temporal characteristics of subjects' performance showed that articulation rates dropped and that unfilled pause times increased more during simultaneous interpretation than during shadowing. Other studies carried out by Gerver included the effect of source language presentation rate on interpreters' performance; the effects of noisy listening conditions on the conference audience; the use made by interpreters of source language pauses to segment the message.

More relevant to the present study, Gerver set out to find out whether simultaneous listening and speaking affected performance on subsequent cognitive tasks, namely comprehension and recall of material processed. Subjects were trainee simultaneous interpreters who a) listened to, b) shadowed, and c) simultaneously interpreted into English recordings of passages of French prose. Gerver hypothesized that simultaneous listening and speaking would impair subjects' ability to comprehend, store and recall input and that therefore, test scores for both shadowing and simultaneous interpretation would be lower than for plain listening.

"The additional task of translating could either still further impair interpreters' ability to understand and retain what they hear, or the more complex analysis of the incoming message which is necessary in order to translate, rather than merely repeat it, would assist comprehension and recall".

(Gerver, 1976) p. 184

Results indicated that, in fact, comprehension was impaired by simultaneous listening and speaking, since test scores were higher after listening than after simultaneous interpretation or shadowing. Furthermore, since test scores were significantly higher after simultaneous interpretation than after shadowing, it appeared that the simpler of the two conditions, namely shadowing, affected comprehension more than when the task involved simultaneous interpretation, a task implying the more complex decoding and encoding of material.

In addition to the above-mentioned research, there are several



factors which support the notion that during simultaneous interpretation, items are being processed at a deeper level than during shadowing of the same material. If simultaneous interpretation were to be compared to shadowing, the former could be described as 'phrase shadowing' and the latter as 'phonemic shadowing'. Phrase shadowing, as defined by Norman (1976) is where the words are slightly delayed behind the input and where the lag is long enough to take advantage of the structure of the language, but not so long as to impose a burden on memory. Phonemic shadowing, as defined by Norman (1976), has a shorter lag in that the shadower need not wait until the completion of the sentence. Therefore, processing time allowed for simultaneous interpretation is longer than for shadowing.

Both simultaneous interpretation and shadowing offer the experimenter a reliable way of measuring the processing time required by each task: the subject processes the material overtly in each case and the lag or ear-voice span may provide more evidence to support the hypothesis that simultaneous interpretation demands more processing than shadowing. Gerver (1972a; 1974a) found that even under noisy conditions, there was a greater ear-voice span for simultaneous interpretation than for shadowing.

Another factor that must be taken into account is that translation takes time. Oléron and Nanpon (1965) studied delays in simultaneous interpretation and found that these could range from 2 to 10 seconds. The extent of this delay according to the authors is determined by the difficulty experienced by the interpreter when organizing the incoming stimuli: he must wait for a certain amount or chunk of material before he can begin interpreting.

Treisman (1965) compared the speed with which bilingual subjects could interpret from French into English and vice versa. To this effect, she compared the lag of the subjects and found that it was mainly determined by the amount of information present in the incoming message. She also found that interpretation was slower than shadowing. In another study, Hepler (1966) combined syntactic trans-

formations and translation with bilingual subjects. She found that combining transformation with translation took significantly longer than transformation within the language of the stimulus.

Translation of word lists also takes time. In an earlier study, Oléron and Nanpon (1964) compared response latencies for translation and repetition in the same language of orally presented words. On the average, translation took 0.4 seconds longer than simple repetition of the same items. This difference is to be expected as in the comparison between simultaneous interpretation and shadowing: shadowing involves the subject only storing words briefly in memory without extensive processing and interpretation is dependent upon information stored in longer term memory for further processing, i.e. translation. This access time may be in part due to language-switching and in part to the search for the appropriate word in the other language (Gerver, 1970). In other words, interpretation requires more 'intellection' of the incoming message (Glemet, 1958). In addition to the preliminary phonemic analysis, the conveyance of the original meaning of the message through translation requires a deeper and more extensive analysis of the items.

Treisman (1965) found that translating was more difficult than shadowing not only because of the decreased familiarity of either input or output, but also because of the increased decision load imposed by the more complex transformation between input and output. Subjects were relatively more dependent on meaning and were less able to make use of grammatical rules in an unfamiliar language than they were to use the other forms of redundancy. Similarly, the syntactical constraints appeared to be relatively less helpful in translating than in shadowing and the lack of any semantic constraints seemed more disruptive of efficiency in translation. The main positive finding about the ear-voice span was its greater length for translation than for shadowing. The difference in size of the span again suggests that the units of speech used in translation may be longer than those adopted for shadowing, extending over four and five words rather than three.

### Consecutive Interpretation:

During consecutive interpretation, the interpreter hears a segment of speech in source language B (French, for example), lasting approximately five minutes. At the same time as he is processing the speech, the interpreter is making rapid notes into target-language A (English). When the segment of the speech is over, the consecutive interpreter is then asked to reconstruct the original speech orally, by way of the notes taken.

The consecutive notes are highly personalized and vary from interpreter to interpreter. A detailed study of conference interpreter-trainee's notes will be dealt with in this study. So far, it appears as though the interpreter abstracts the information presented to him through a form of selective listening/processing, in that he only makes notes of the items which seem to be more important to him. He discards approximately two-thirds of the incoming items, making notes on the other third, translating from source language B into target language A as he writes down his notes. It is important to mention at this stage that translation usually occurs at this specific moment, that is as the notes are being taken and not afterwards, during consecutive delivery, for example. Although this is not always the case (some bilingual interpreters claim that they often take their notes in the same language as the source language and translate during consecutive delivery), most schools of interpretation train the students to take their notes immediately into the target language. Notes thus serve as an externalized and graphic form of short-term memory and then as cues or tags when the interpreter generates the translated version of the original speech.

Research undertaken on note-taking in university settings may help shed some light on the process of note-taking although very little has been done on conference interpreters' note-taking techniques (Séleskovitch, 1975).

Some students contend that taking notes during a lecture hampers their listening comprehension. They maintain that while they are

busy writing down one idea, they do not hear others (Peters and Harris, 1970). The rare studies dealing with the effects of note-taking on recall offer only mixed support for the value of note-taking. Pauk (1963) for example, found no differences on immediate recall between subjects who took notes and those who did not. Eisner and Rohde (1959) found no differences in performance the following day between subjects who took notes during a presentation and those who took notes following the same presentation. Both groups were permitted to study their notes during the interim between the presentation and the testing. McClendon (1958) reports no significant differences in either immediate or delayed recall between those students who took notes and those who did not.

Crawford (1925) and McHenry (1969), however, reported significant differences favoring note-takers on true-false and multiple-choice tests administered immediately following a study period. McHenry found all three of his note-taking conditions (namely copious notes, abbreviated notes and fact-principle notes) had a significant effect. All three groups scored higher than a no-note control group on a multiple-choice listening comprehension measure. Peters and Harris (1970) also indicate that subjects who were permitted to take notes during a taped presentation or who were provided with prepared notes in a topical, outline form, performed significantly better on a subsequent multiple-choice test than did a no-note control group whether or not time was provided for review. Peters (1972) doubts the notion that the note-taking activity interferes with the actual reception of the material. Instead, it seems that note-taking is an attention-directing activity which limits the amount of information processed whether it is presented orally or in written form. He goes on to hypothesize that when the decision is made as to what to include in the notes, other information inputs are disregarded or simply not processed; interestingly enough, Peters adds that when these decisions are not required of the subject (i.e. listening without taking notes), larger quantities of information are

processed.

Notes appear to serve either or both of two functions:

1) as an external storage mechanism (Miller, Galanter and Pribram, 1960) and 2) as an encoding mechanism where they provide a source for later study or reference by the learner. They allow the learner to transcribe whatever subjective associations, inferences and interpretations may have occurred to him while listening. DiVesta and Gray (1972) examined this dual function of note-taking and found that when note-taking is used solely for the purpose of external storage, notes tend to be taken in a mechanical fashion, interfering with attention and are thus incompatible with efficient learning strategies. On the other hand, the kind of note-taking which serves a role in encoding was more efficient than one used solely for external purposes. The encoder has put the material into long-term memory and a transaction between the learner and the material has taken place:

"The learner has linked the material to his existing cognitive structure: he has made it meaningful. Instead of interfering with learning as originally hypothesized, note-taking appears to sensitize the learner to certain aspects of the communication. The transaction is one of acting on the incoming information, sifting out relevant material, and organizing important content which is then recorded by the learner.

The increased attention given to these concepts while taking notes increases the probability that the concept will be retrieved even though there is little chance to review the notes immediately after studying. We speculate that note-taking and rehearsal function as learning aids which facilitate encoding".

(DiVesta and Gray, 1972) p. 8-9

Another important investigation worth including in this review is one undertaken by Fisher and Harris (1973) which set out to examine the effect of note-taking and review on subsequent recall. The following conditions were tested:

- 1) N - RON: (notes and review own notes)
- 2) NN - RLN: (no notes but review lecturer's notes)
- 3) N - RLN: (notes and review lecturer's notes)
- 4) N - MR: (notes and mental review)
- 5) NN - MR: (no notes but mental review)

When testing for recall of information processed after each condition, Fisher and Harris found that the best results were provided by Condition 1, N - RON, where both encoding (that is the subject taking his own notes) and external memory function (reviewing one's own notes) were allowed. The second best results came following condition 2, NN - RLN, where no encoding as such was allowed (the subject was not permitted to take notes) but where the external aspect of notes (that is, reviewing the lecturer's notes) was allowed. The poorest recall came following the final condition, NN - MR, where both functions of note-taking, encoding (no notes taken) and the external factor (mental review) were not present. Fisher and Harris concluded that note-taking serves both as an encoding function and as an external memory function with the latter being more important. Furthermore, they claimed that of the two functions, the one serving as the external memory device provided the greater facilitating effect on recall.

When examining note-taking in the light of human information processing, notes provide a wealthy area of investigation. If we were to place the three activities familiar to an interpreter (shadowing, simultaneous interpretation and consecutive interpretation) along a continuum according to the number of analyses carried out during each task, it would appear that consecutive interpretation involves the most. In addition to the phonemic analysis of the incoming stimuli, the interpreter begins by selecting those that will be most useful to him during subsequent delivery. Unlike shadowing, where one 'parrots' all incoming stimuli and where conveying the meaning is not the primary concern of the shadower, consecutive interpretation requires an original abstraction and selection of stimuli, a transformation by

translation, and finally, a reconstruction during the consecutive delivery itself. Since over two-thirds of the incoming stimuli are discarded by the interpreter when examining his notes (in that they do not appear in the actual notes), a closer examination of the notes that are retained would provide a study in itself. In this study, notes are considered as an externalized form of information processing in that they provide the experimenter with graphic mnemonics. These mnemonics could be labeled as an externalized form of rehearsal as if the interpreter wished to 'hold' certain key items long enough in store to use them later on as triggers during recall. This, the actual note-taking is the first overt form of rehearsal performed by the subject. The second occasion for rehearsal is provided during consecutive delivery when the interpreter reconstructs the speech by way of his notes.

Unlike the shadowing and simultaneous interpretation paradigms, consecutive interpretation does not provide the experimenter with comparable means of measuring the time spent in processing the input, since the overall amount of time involved during consecutive interpretation is longer than either shadowing or simultaneous interpretation. Furthermore, the processing activity per se may take place in one or several of the following phases:

- a) while the subject attends to the incoming message;
- b) while the subject is taking notes;
- c) during the translation of the notes;
- d) during the consecutive delivery.

Since it is well-established that many cases of unsuccessful recall are due to failure of the retrieval mechanisms rather than to failures of registration or storage (Cofer, 1941; 1967), the present study proposes to compare comprehension and recall after each stage of processing, in other words

- a) after passive listening to a speech without allowing the subject to take any notes;
- b) after note-taking but where the notes will have been removed

from the subject immediately following the note-taking phase, in an incidental learning paradigm;

c) after note-taking and consecutive interpretation of the speech by the subject who has been allowed to refer to his own notes, in an intentional learning paradigm.

The present study also proposes to examine the physical aspect of consecutive notes collected from each subject. Although there is a respectable body of literature covering note-taking among college students during lectures, very little research has been carried out on note-taking in and among conference interpreters. Several differences come to mind: notes taken during a lecture are reviewed several hours, weeks and sometimes months after the lecture. Consecutive notes on the other hand are used immediately following the delivery of a speech and are generally never referred to afterwards. Secondly, notes taken during college lectures are usually taken in the same language as that of presentation. For consecutive interpreters however, the message presented to them is in one language usually their 'passive' language (their second language) and the interpreter is asked to deliver the same speech in another language, usually his mother-tongue. In other words, translation occurs at some stage in the process of consecutive interpretation: either during the encoding stage when the interpreter is taking notes in language A on an incoming message in language B, or during the reconstructive stage when the interpreter is asked to deliver the same speech in target language by way of notes.

Bearing these two major differences in mind, a physical description of consecutive notes will be included in this study along with some suggestions as to what occurs between each processing stage of the consecutive interpreter's task: i.e. what actually takes place between input and note-taking, between note-taking and consecutive delivery, between consecutive delivery and recall. In addition, overall stages will be examined, such as what occurs between input and consecutive delivery, input and recall and finally between note-taking and subsequent recall.



The purpose of the present investigation therefore, is to apply some of the hypotheses put forward by Craik and Lockhart (1972) on depth of processing, namely that deeper, semantic processing produces better memory than shallow, more superficial processing, to four tasks carried out by interpreters, which are listening, shadowing, simultaneous and consecutive interpretation. By examining the amount of comprehension and recall among interpreters following the tasks, it is hoped to determine which particular task involved the greatest amount of processing and which task, the least. However, if we were to place these aforementioned activities along a hierarchy of stages of processing, one could hypothesize that the amount of attention paid to the stimuli and the varying task demands in each case could help in predicting the depth at which the message is being analyzed in each condition, and the amount of recall after each condition.

#### 1. Listening:

Listening will serve as a control condition: it represents a unitary activity, whereas in the other three conditions (shadowing, simultaneous and consecutive interpretation), listening is always combined with some other activity and thus serves as the 'common denominator' to all four tasks. For example, shadowing involves both listening and speaking; simultaneous interpretation involves listening, translating and speaking; consecutive interpretation requires listening and note-taking.

Listening gives the experimenter one slight problem in that the subject, whilst listening, makes no overt response and thus provides no reliable way of measuring the amount of 'attention' paid to the incoming material. Only the amount and quality of recall following listening will enable us to determine the amount of 'attention' the subject paid while listening. One could hypothesize that since the listener is not sharing his attention with other activities, he may be devoting his full attention to the listening task and that as a

result, recall following listening will be superior to that following any of the other three experimental conditions.

On the other hand, the additional processes of vocalization required during shadowing and simultaneous interpretation for example, which could be considered as additional analyses carried out on the incoming stimuli, could warrant the opposite hypothesis: that recall will be superior after either shadowing and/or simultaneous interpretation than after listening. It thus becomes mandatory to compare the results obtained on recall following listening and following shadowing.

## 2. Shadowing:

Shadowing may be considered as a "Type I processing" (Craik, 1973) or as a form of 'repetitive rehearsal' (Bjork, 1975) where the items are merely repeated and not necessarily rehearsed. If the information is maintained at this same level, an item's accessibility may be prolonged but will not necessarily lead to the formation of a more permanent memory trace. However, the essential feature of primary memory retention is that the aspects of the material are still being processed or attended to. During shadowing, a subject is asked to repeat a message which is presented to him auditorily. In this experiment, subjects will be asked to shadow the material phonemically, that is without waiting for the completion of a phrase or even for the completion of a word. This is to ensure that the lag is shorter than in phrase shadowing but not long enough for subjects to take advantage of the structure of the language. Also, it will ensure that the amount of processing time required by the task is shorter than in either of the other two conditions, that is simultaneous and consecutive interpretation.

## 3. Simultaneous interpretation:

Gerver (1974) had conference interpreter-trainee subjects listen to, shadow and interpret simultaneously French prose passages into English. Subsequent scores of comprehension and recall yielded

higher scores in the listening condition than in the interpretation condition, which in turn yielded higher scores than following the shadowing task. This experiment will be replicated in the present study: recall following simultaneous interpretation will be compared to recall after both shadowing and listening. It is hypothesized that since items processed during simultaneous interpretation take more time than during shadowing, they are being processed at a deeper level and will therefore be recalled more successfully.

#### 4. Consecutive interpretation

If we were to consider the tasks required of an interpreter and place them in a hierarchy according to the number of analyses carried out during each task, it would appear that consecutive interpretation involves the most: the subject seems to amalgamate all the conditions of the experiment: 1) he listens and attends to incoming stimuli (condition I); 2) he simultaneously translates the items (condition II) by making notes of the ones that are salient, in his opinion. Furthermore, he holds the items for longer periods of time than in either shadowing or simultaneous interpretation since he does not deliver his consecutive interpretation until he has heard and recorded his notes, that is, until he has heard the entire message. The note-taking aspect per se serves as an externalized form of rehearsal (rehearsal I) and the consecutive delivery constitutes the second form of rehearsal (rehearsal II).

To recapitulate, Experiment I will examine recall and recognition following the four above-mentioned conditions: 1) listening; 2) shadowing; 3) simultaneous interpretation; and 4) consecutive interpretation.

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## CHAPTER II

### INTERPRETING AND DEPTH OF PROCESSING:

This chapter is concerned with interpreters' retention of prose following three experimental tasks, namely shadowing, simultaneous interpretation and consecutive interpretation, and one control task, listening. The experiment was designed to investigate the variations in an interpreter's retentive ability when asked 1) to process a given message to varying depths; 2) to perform recognition tests in the language of presentation when this language is the subject's passive language; and 3) to recall the message in the subject's mother-tongue, albeit different from the language of presentation.

Craik and Lockhart (1972) proposed the depth of processing hypothesis by way of a series or hierarchy of processing stages through which incoming information is passed. According to their view, the existing dichotomy between short and long-term memory stores is more a function of the different coding processes than the separate stores themselves, with trace durability a function of the way in which the material is encoded. In other words, it is the depth of the analyses which determines retention and a greater degree of semantic or cognitive analyses are performed at deeper levels in the hierarchy.

In this experiment, we propose four levels of such analysis in the form of listening, shadowing, simultaneous interpretation and consecutive interpretation. What cannot yet be determined is the hierarchy or the order in which these analyses fall according to the depth of processing continuum. However, by reversing the order of the theory, one would hope to be able to determine which level of the above-mentioned analyses is the deepest and the shallowest. In other words, by examining the amount and the quality of recall following each task, the depth at which the message was processed will be determinable.

Since the language of presentation was French and the language of recall was English, it was hoped to determine whether or not the translation factor constitutes an added form of processing for the subject.

Most theoretical approaches to bilingual memory propose one view - which states that there are two separate memory stores and that any

interaction between the two takes place in the form of translation - or the view which holds that bilingual memory is a single system that taps into two systems by a code-switching mechanism of some kind (Paivio & Begg, 1981).

Among studies supporting the two-store position, Kolers (1964) asked his subjects to practice saying either their native alphabet or the English alphabet backwards, and tested them on the other. Because there was no evidence of positive transfer across languages, Kolers opted for the notion of two independent language systems that are probably 'insulated from each other' (McCormack, 1977).

Another study required that its subjects recall freely from unilingual, bilingual and trilingual lists, the languages being English, French and Spanish. In this study, Tulving and Colotla (1970) found that recall was best with unilingual lists, followed by bilingual lists and with poorest recall resulting from the trilingual lists. Researchers interpreted the poorest recall from multilingual lists as reflecting an impairment in the organization of words across language boundaries (McCormack, 1977). Therefore, their data are consistent with the notion that a bilingual's two languages exist in relative isolation from one another.

Among the studies supporting the single-store model, Young (1972) used a same-order serial transfer paradigm in that his subjects were exposed to a set of items in a constant serial order over a succession of trials and subjects were asked to attempt to anticipate each item prior to its presentation. They then learned a second list in which either synonyms, antonyms or gender-related words were substituted for the items on the first list. Positive transfer would be expected according to all existing theories of serial learning, in other words, that subjects should learn the second list in fewer trials than a control group. Results showed that no positive transfer was revealed. However, when the items on the second list were translations of those from the first list, bilingual English-Spanish subjects exhibited significant amounts of

positive transfer (Young and Saegert, 1966).

Another investigation employed a multitrial free-recall procedure with English-Spanish bilinguals as subjects (López and Young, 1974). Subjects were presented with lists of words and asked to attempt to recall as many as possible, but, unlike the serial-learning situation, items appeared in a different random sequence from trial to trial and subjects were free to recall them in any order. For experimental conditions, the free-recall items were words which were the translations of those with which subjects had been familiarized. For the control conditions, the prefamiliarization set consisted of words from the same class as those employed for free recall but a translation relationship did exist. The investigators argue that if the two linguistic systems are in fact independent, then there should be no positive transfer between the first and the second task, in other words, that there should be no familiarization effect. Results, however, indicated that positive transfer did occur regardless of the language of the second task.

In an investigation conducted by Liepman and Saegart (1974) subjects were familiar with both Arabic and English. The Anderson and Bower paradigm was followed, where subjects are exposed to each list in a series only once and subsequently asked for a free recall. With this paradigm, there is considerable overlap of the same words from list to list and Anderson and Bower report that recall becomes poorer as subjects are exposed to more and more lists ; they attribute this to increasing amounts of confusion regarding list membership. The Liepman-Saegart adaptation of the paradigm used lists of homogeneous and heterogeneous items with respect to language. The authors argued that if the interdependence notion were valid, then performance would show a greater relative deterioration across trials when the lists are bilingual than when they are unilingual since there would be two sources of confusion, one for language and one for list markers (McCormack, 1977).

On the other hand, should the independence notion hold true, subjects would be expected to show less relative deterioration with bilingual lists, since they would be aided by their ability to discriminate on the basis of language. Results supported the single-memory store position.

The fourth study (Saegart, Kazarian and Young, 1973) used a bilingually modified version of the part-whole negative transfer paradigm. In the part-whole setting, subjects were first required to learn a 'part' list and then a 'whole' list consisting of the part-list items in addition to an equal number of new items. In both tasks, the multi-trial free-recall procedure was employed. Negative transfer or poorer performance on the part of experimental subjects relative to appropriate controls was typically observed following the second task. Negative transfer however, was not observed when the second-list items were from the dominant language. This finding is more consistent with the independence position which would predict no cross-language organization.

The last investigation was conducted by Colletta (1975), in which a modification of Posner's (1969) 'same-different' paradigm was employed. Subjects were presented with two items and then asked to judge whether they were the same or different with respect to some predetermined dimension. Reaction times were the dependent variables, and subjects were French-English bilinguals, the dimension being one of synonymy. For both 'same' and 'different' judgments, the pairs of items were either homogeneous or heterogeneous with respect to language. Colletta reasoned that should there be separate linguistic stores, the bilingual judgments should produce longer reaction times than the unilingual decisions since a translation process would presumably be required. However, should there be a single memory store, no differences in reaction time would be expected between the unilingual and bilingual conditions (McCormack, 1977). " The latter was the case and these findings offer unambiguous support for the interdependence hypothesis.

In the case of the present experiment, where subjects were asked to recall in English although the language of presentation was French, the question was whether the additional task of translating (or code-switching) would impair interpreters' ability to retain what they had processed, or, on the contrary whether the more complex analysis of the incoming message which is necessary in order to translate, rather than repeat the message in the same language, would assist in recognition and recall. In other words, does translation take up more processing capacity and leave the subject less able to commit the material to memory, or does translation lead the subject to process material more deeply and thus remember the material better?

The no-translation condition will become part of a subsequent experiment.

#### EXPERIMENT I:

The subjects were 16 interpreters, 8 of whom were professional conference interpreters, belonging to the A.I.I.C. (Association Internationale d'Interprètes de Conférence, all having interpreted for more than five years. The remaining 8 subjects were trainee-interpreters, all enrolled on a six-month intensive formation course at the Polytechnic of Central London in order to obtain the Diploma in Conference Interpretation Techniques, none of whom had interpreted for less than 3 months or for more than 6 months. Among the 8 professional interpreters, 4 were male and 4 were female; among the 8 beginners, 4 were male and 4 were female. The mother-tongue of all 16 subjects was English and all subjects claimed French as one of their passive languages, a language they interpreted from and not necessarily into.

#### Experimental design:

A 4 x 4 Graeco-Latin Square design was used in an intentional learning paradigm where each subjects was asked to 1) listen to, 2) shadow, 3) interpret simultaneous-and 4) interpret consecutively four French prose passages of equal length.

Listening involved simply ... (continued.../)



attending to an auditorily presented passage without performing any task other than plain listening. Shadowing involved repeating, word-for-word, in the same language and at the same time, the entire passage in French. Simultaneous interpretation involved orally translating or interpreting the prose passage from French into English at the same time as the original French input passage was presented to the subject. Finally, consecutive interpretation involved having the subject listen to a French prose passage and take notes in English at the same time. When the incoming passage was over, the subject was asked to give a consecutive delivery of the text on which he had just made notes: this involved rendering a translated reconstruction of the entire text into English, using the notes as guidelines.

Prior to the experiment, subjects were told that each condition would be followed by two tests in order to measure the amount of recall and recognition. First, a recall test to be given in English, where subjects were simply asked to recall as much as possible of the prose passage they had just processed. This was immediately followed by a recognition test in French, in other words, in the same language as the original language of input, albeit the subject's passive language.

Both texts and tasks were randomized and counter-balanced across subjects. (See Appendix page 321-b for the experimental design).

#### Procedure:

Four French passages of approximately 300 words each were selected from "General Studies French" by Light and Howitt, 1966. The passages dealt with the four following topics: a) man's flight into space and possible inner ear ailments resulting from space flights; b) alcoholism in France and statistical explanations regarding its increase over the years; c) camping in France as a form of holiday-making; d) the construction of a tunnel under the Channel linking France and Great Britain, its beginnings and historical implications. These texts (See Appendices A-1 through D-9)

lent themselves to the construction of questions on their factual content and made no special demands on subjects' knowledge of technical vocabularies. The passages were recorded by a female native-speaker of French, at approximately 1.6 words per second.

Each subject heard the stimulus tape under simulated conference interpretation conditions, although some subjects complained that the absence of a live audience may have detracted from their performance. However, since their ability to recall was more important than their actual performance during the interpretation task, the absence or presence of an audience was not considered a significant factor in this experiment.

The experimental tape was relayed to the subject through stereophonic headphones coming from one tape-recorder and subjects' recall was recorded simultaneously onto a Sony cassette-recorder for subsequent transcription and evaluation.

Following each condition, subjects were asked to recall, in their mother-tongue, English, as much as possible of the input speech presented to them in source language, French. When the subjects could recall no more, they were immediately presented with recognition tests in three parts and in the following order:

a) word or lexical recognition test:

containing 3 nouns, 3 verbs and 3 adjectives taken from the original French input text and therefore in the same language. In addition, there were synonyms for 3 other nouns, 3 other verbs and 3 other adjectives. These 18 items were arranged in a vertical column in random order. The subjects' task was to indicate, by ticking 'yes' or 'no', which words had or had not occurred in the original passage they had just processed.

b) content or semantic recognition test:

containing 14 multiple-choice questions on the informational content of the passage with four choices for each question. The passages selected lent themselves to creating such questions in

order to determine how much each subject attends to each passage he or she was asked to process.

c) word-order or syntactic recognition test:

containing a phrase or sentence taken verbatim from the original source-language text along with two paraphrases of the phrase or sentence which nevertheless preserved the original meaning of the input.

The rationale behind these recognition tests was to devise a means of determining which aspects of both semantic and non-semantic memory were more susceptible to forgetting. Sachs' (1967) experiments on syntax recognition scores indicated that subjects' recognition for change in form was close to chance level but that changes in the meaning of sentences was still recognized extremely well.

The order in which the three recognition tests was administered could not be balanced across subjects since the last test - the word-order or syntactic recognition test - contained some of the answers to the two previous recognition tests, namely vocabulary items and answers to the multiple-choice questions. Certain investigators have found that recognition is impaired when a recall test is interpolated during the retention interval (Belbin, 1950; Kay and Skemp, 1956), in that it interfered with recognition of the stimulus material some minutes later. Hanawalt and Tarr (1961) however, found some evidence for a facilitation effect in that recall strengthened the retention of items recalled and left unaffected the retention of items not recalled. Furthermore, Hanawalt and Tarr used forced-choice recognition where subjects must choose a specified number of items presented. For example, in the familiar multiple-choice test, only one of the presented items is correct and the subject is asked to select one item. In the present experiment, the forced-choice recognition test was used and results obtained following the recognition tests were expected to yield higher scores than those obtained as a result of recall scores (Brown and Packham, 1967).

Although both recall and recognition tests were administered to

all subjects immediately following each task, some tasks took more time than others: therefore the onset of recall and recognition tests, i.e. the time at which they were administered, were not uniform across all conditions.

Let us now consider each task individually. Listening offers no measurable indication to the experimenter as to the amount or intensity of processing the subject is engaged in. Furthermore, there is no way of determining if the subject is listening in the language of presentation (French) and preparing to recall in English by saving the translation until the recall task, or whether he is listening to the French input by mentally translating into English as though it were a form of inner speech, thus getting rid of the translation task before the free recall demands are placed on him. It could also be that bilingual interpreters do neither, since long-term memory is conceptualized as being primarily semantic in nature and the language in which information is conveyed would be superfluous (Rose, Rose, King and Pérez, 1975). Whatever the case may be, listening offers no overt and concrete means for the experimenter to measure or monitor the amount of processing engaged in by the subject.

Consider the second task required of the interpreter: shadowing. If the language of presentation is French and the subject is asked to shadow in the same language, the experimenter is certain that the processing is being carried out in the same language as that of presentation (French) and that the translation factor is most likely being delayed until recall is asked of the subject. Furthermore, the overt vocalization involved during shadowing also provides the experimenter with some tangible means of measuring the amount of processing the subject is engaged in - the time-lag between the stimulus and the utterance response produced by the shadower, for example, or the number of errors and omissions perpetrated by a shadower who is asked to shadow phonemically as opposed to phonetically (Norman, 1976).

Simultaneous interpretation, which requires that the subject listen to a French passage and translate it simultaneously into English, puts more emphasis on immediate translation, whereas shadowing puts more emphasis on source language at input and translation at output (although it is entirely possible that for simultaneous interpretation, the subject is recalling the original text and re-translating it).

Finally, if we consider consecutive interpretation where the subject hears a passage in French, translates it while processing since his notes are taken down in English delivers the entire consecutive interpretation with the use of his notes before he is asked to recall the original. Although the experimenter is certain that translation per se is carried out during the encoding phase (i.e. during note-taking), the onset of both recall and recognition is considerably delayed compared to the other three conditions: this delay is equivalent to the amount of time it takes the subject to render his consecutive delivery, each delivery varying in length, depending on the subject.

Since processing time is an indication as to the amount of processing (Craik and Lockhart, 1972), analysis of this experiment will examine those conditions which required longer processing times (consecutive interpretation) against those which take up less processing time (shadowing and simultaneous interpretation) or no measurable time (listening).

Subsequent analysis will also examine those conditions requiring vocalization during processing (simultaneous interpretation and shadowing) and compare them against the conditions where the subject was silent during processing (listening and consecutive interpretation).

The rationale behind this was to determine whether simultaneity of listening and speaking would enhance or hinder a subject's capacity to encode, process and recall. Also, it is in-

teresting to note that in one condition, simultaneous interpretation, the subject will be repeating the same message twice: once while interpreting from French into English and a second time when recalling in English.

To recapitulate, subjects were asked to recall in English but the recognition tests were administered in French, which was also the language of presentation. In other words, recall involved translation, whereas recognition did not. Since the purpose of this experiment was to measure interpreters' recall and recognition following various tasks in order to determine which task produced the best and the poorest recall, it was felt that recall should be carried out in the subjects' mother-tongue, English. Furthermore, it is a natural event in the profession of an interpreter to interpret into his native tongue rather than into his passive language. In other words, Experiment I set forth to examine translation as a form of processing, whether the translation was prepared under listening, shadowing, simultaneous or consecutive interpretation conditions. The question is whether translation per se enhances subsequent recall or whether it hinders it, or if translation can be considered as a form of processing.

As far as recognition measures are concerned, since the subject actually heard the passage in French, it seemed natural that the recognition tests be presented in the same language. Furthermore, translating the recognition tests into English as testing materials would have automatically involved some semantic change.

#### Scoring procedure:

In order to create plausible content questions for the recognition tests and to facilitate scoring of recall protocols, four highly concrete passages were selected as stimulus material. The passages, selected from "General Studies French" (Light and Howitt, 1966) are grouped according to their level of difficulty. In order to maximize the degree of similarity in the difficulty level of the texts, all four texts were chosen from the same section

as judged by the editor. Furthermore, both texts and tasks were counter-balanced across subjects.

Each passage was carefully trimmed to 300 words and included equal amounts of propositions, digits and concrete facts. (See Table I-0 and I-1). Following the methodology proposed by Kintsch and van Dijk (1978), the passages were broken down into a structured list of propositions. Each proposition contained a predicate or relational concept, along with one or more arguments, each fulfilling a semantic function whether it be agent, object or goal. In order to score recall protocols, the original input text was first broken down into a structured list and then matched against the transcription of each subject's oral recall, also transcribed in a propositional format and maintaining the order in which these propositions had been presented in the original passage.

Once the original passage had been subdivided into its propositions, each subject's recall was scored according to the preservation of truth and meaning in each proposition. Deletions were permitted when they involved replacing a redundant predicate by 'it' for example. No points were subtracted for generalizations where each sequence of propositions was substituted by the general proposition denoting an immediate superset. Furthermore, constructions were permitted when a sequence of propositions was substituted by a proposition denoting a global fact (van Dijk, 1977).

Table I-1 provides a sample of the scoring procedure for the first two sentences of one of the actual texts used in the experiment, The Channel Tunnel, along with one of the subject's transcribed recall. Two judges were used to score and the reliability was .85.

Since an interpreter's task is to transmit the meaning of a message, the scoring procedure was more concerned with the reproduction of 'idea-units'. Furthermore, it was felt that the

recognition tests could be devised to examine other types of memory more closely, namely lexical, semantic and syntactic aspects of memory for text.

Results:

Recall and recognition scores will be dealt with separately. Table I - 2 presents a summary of the free recall results which were recorded in terms of the correct number of propositional idea-units recalled in percentage form. All scores and figures will be presented in the following order, beginning with listening, the control condition, followed by a linear progression ranging from the supposedly shallowest form of processing, shadowing, onto simultaneous interpretation and ending with consecutive interpretation.

A two-way analysis of variance (Winer, 1962) was carried out and showed that the type of task required of the subject clearly influenced his subsequent recall. This effect was found to be significant beyond the .001 level ( $F = 9.04$ , d.f. = 3, 36). See Table I - 3.

Post-hoc tests of multiple comparisons (Guilford, 1973) showed that recall scores were significantly higher following the listening condition ( $\bar{X} = 45.19\%$ ) than after the shadowing condition ( $\bar{X} = 30.19\%$ ) (Scheffé  $F = 6.48$ ;  $p < .01$ ; d.f. = 3, 36). Scheffé post-hoc tests also revealed that recall scores following consecutive interpretation ( $\bar{X} = 45.00\%$ ) were significantly superior to those obtained following the shadowing condition ( $\bar{X} = 30.19\%$ ) ( $F = 6.31$ ;  $p < .01$ ; d.f. = 3, 36).

There were no significant differences found between listening, consecutive interpretation and simultaneous interpretation relative to recall scores. There were no significant differences found between shadowing and simultaneous interpretation either. It seems as though recall scores following shadowing were significantly lower only when compared against listening and consecutive interpretation.



In addition to the task effect, an analysis of variance also indicated a significant text effect ( $F = 14.02$ ;  $p \leq .001$ , d.f. = 3, 36), which indicates that recall differed as a result of one or more texts. Since all four texts had been selected from the same level of difficulty - section in the Light and Howitt manual, and since both texts and tasks were counter-balanced across subjects, it was felt that no-pretesting was necessary. Subsequent analysis, however, indicated that the one text which gave all subjects the most difficulty in terms of recall was the one dealing with Alcoholism in France. Furthermore, since Experiment II and III included only three conditions, thus requiring only three texts, the text on alcoholism was automatically discarded for the subsequent experiments.

There were no significant differences found on recall scores between professional interpreters and trainee-interpreters, nor were there any significant differences in recall scores between male and female subjects. See Table I - 5.

#### Recognition scores:

Interpreters are never asked to recall a speech they have just interpreted. Therefore, it would be of little experimental value to present interpreters with nothing more than a free-recall test following each condition. Furthermore, a straight-forward free recall test may fail to detect certain aspects of memory that semantic and syntactic recognition tests may capture.

The three types of recognition tests included lexical, semantic and word-order measures. The lexical recognition test consisted of 18 items, 9 of which appeared in the original passage and 9 of which had not, although their synonyms had. Subjects received one point for every correct answer but no points were deducted for incorrect guesses.

The semantic and word-order recognition tests each consisted of 10 multiple-choice items and subjects received one point for every correct answer, and no points were subtracted for incorrect

Table I - 1

Sample of Propositional Scoring for Free Recall

Source-language input in French with English translation		Sample of one subject's recall in English	
<u>Prop Score</u>	<u>Title</u>		<u>Prop Score</u>
3	Le Tunnel Sous la Manche The Tunnel Under the Channel	-	0
2	L'idée de réaliser The idea of building	The idea of building	2
3	un tunnel sous la Manche a tunnel under the Channel	a Channel tunnel	2
2	est loin d'être nouvelle: is far from new.	is in no way a new one.	2
2	C'est d'abord en 1802 It was first in 1802	As early as the 1800's	1.5
2	qu'un ingénieur des Mines that a mining engineer	-	0
2	Roger Mathieu Roger Mathieu	-	0
2	proposa à Bonaparte suggested to Buonaparte	it was suggested to Buonaparte	2
3	alors premier consul who was then first consul	who was first consul at the time	3
2	le projet d'un souterrain plans for an underground tunnel	that a tunnel should be built	1.5
2	éclairé au pétrole oil-lit	-	0
1	et qu'emprunteraient travelled	and which would be used	1
1	des chariots by carts	by carts	1
2	tirés par des boeufs. drawn by oxen.	and bullocks.	1
Input total			Recall total
28	Possible input score:	28	
	Subject's score:	17	17
	Percentage score:	61%	

Table I - 2

Means and Standard Deviations  
Of Propositional Idea-Units Recalled

Listening	Shadowing	Simultaneous Interpretation	Consecutive Interpretation
$\bar{X} = 45.19\%$	30.19%	36.69%	45.00%
S.D. = 11.33	15.08	18.99	16.07

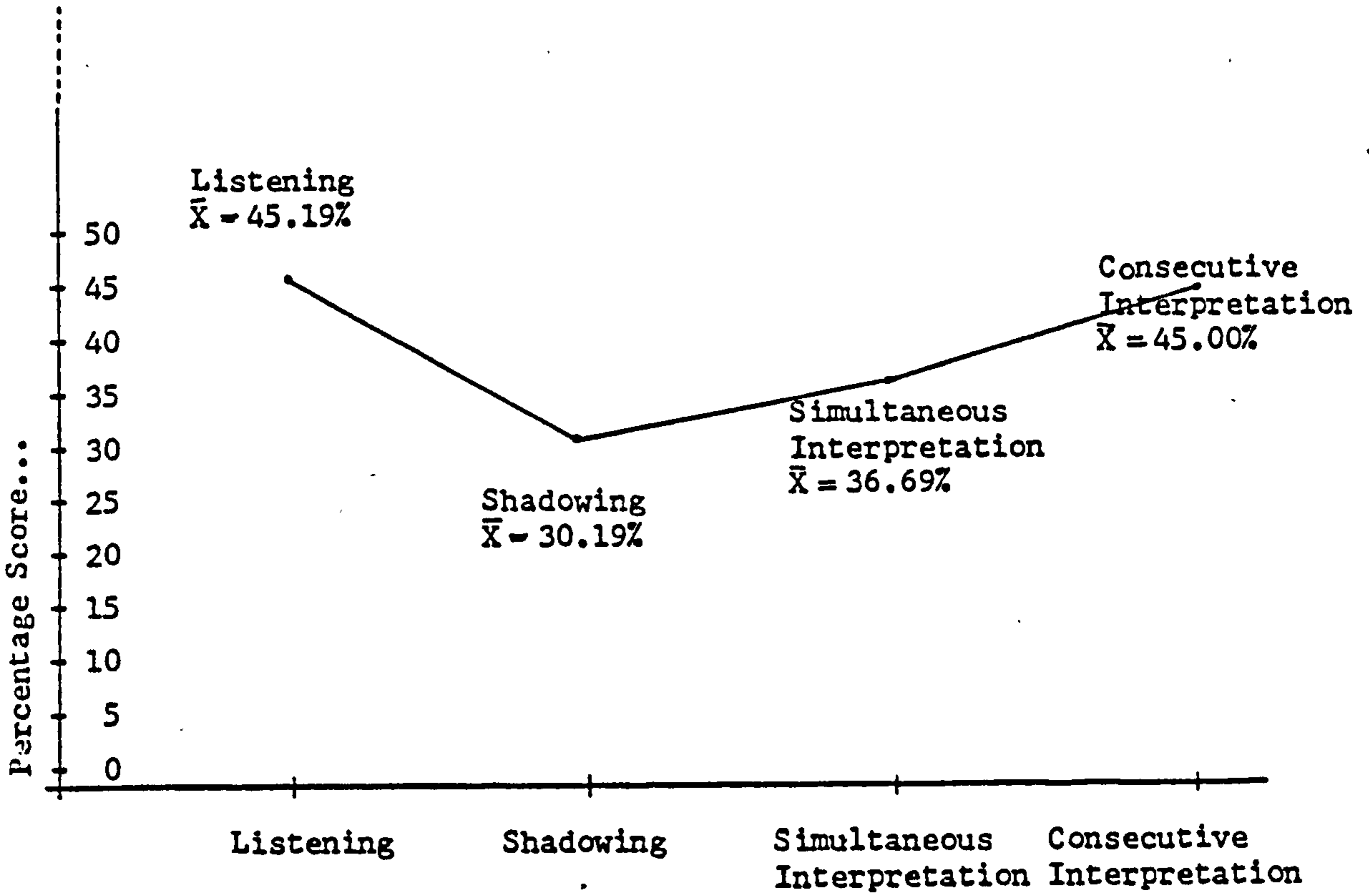


Figure I - 1

Mean Recall Scores

Table I - 3

Analysis of Variance Carried Out  
On The Recall Scores

Source of variation	SS	df	MS	F
<u>Between S's</u>	<u>6789.23</u>	<u>15</u>	452.62	
Groups	984.296	3	328.1	.68 n.s.
S's within groups	5804.934	12	483.74	
<u>Within S's</u>	<u>10341.25</u>	<u>48</u>	215.44	
A order	524.42	3	174.81	1.89 n.s.
B text	3898.545	3	1299.52	14.02*** p < .001
C task	2512.17	3	837.39	9.04*** p < .001
residual	70.566	3	23.52	.25
error within	3335.684	36	92.66	
total	17130.615	63		

Table I - 4

Means and Standard Deviations  
of Mean Recognition  
Scores

Listening	Shadowing	Simultaneous Interpretation	Consecutive Interpretation
$\bar{X} = 73.56\%$ S.D. = 4.5	65.92% 7.73	68.48% 7.55	69.21% 7.22

	Means across Conditions		Listening	Shadowing	Simultaneous Interpretation	Consecutive Interpretation
	(n = 32)	(n = 8)				
Beginners	$\bar{X} = 40.22\%$ 17.89	(n = 8)	47.00% 13.26	35.00% 17.01	36.75% 22.16	42.13% 18.95
Professionals	$\bar{X} = 38.31\%$ 15.19	(n = 8)	43.38% 9.59	25.38% 12.03	36.63% 16.78	47.88% 13.25
Males	$\bar{X} = 41.97\%$ 17.48	(n = 8)	46.13% 12.65	30.88% 15.32	40.13% 21.17	50.75% 16.06
Females	$\bar{X} = 36.56\%$ 15.23	(n = 8)	44.25% 10.63	29.50% 15.86	33.25% 17.24	39.25% 14.83
Male Beginners	$\bar{X} = 43.50\%$ 17.83	(n = 4)	48.25% 13.89	34.25% 13.99	42.25% 25.01	49.25% 19.64
Female Beginners	$\bar{X} = 36.94\%$ 17.89	(n = 4)	45.75% 14.59	35.75% 21.87	31.25% 20.97	35.00% 17.79
Male Professionals	$\bar{X} = 40.44\%$ 17.57	(n = 4)	44.00% 12.99	27.50% 17.94	38.00% 20.19	52.25% 14.50
Female Professionals	$\bar{X} = 36.19\%$ 12.60	(n = 4)	42.75% 6.70	23.25% 2.06	35.25% 15.61	43.50% 12.18

Table 1 - 5

Scores Obtained on Free Recall Tests Comparing Professional and Beginner Interpreters, Male and Female Interpreters.

guesses.

Results:

Recognition scores will be presented both in terms of the mean scores obtained on all three recognition tests followed by the results obtained on each individual test.

Table I - 4 presents a summary of the mean recognition scores obtained on the three types of recognition test following the four conditions.

When comparing the mean scores obtained following all three types of recognition test, an analysis of variance showed that the type of task required of the subject prior to completing the recognition test significantly influenced the interpreter's performance on that test ( $F = 3.83$  ;  $p \leq .05$  ; d.f. = 3, 36).

Scheffé a-posteriori tests showed that the only significant difference lay between listening and shadowing in that recognition scores following listening ( $\bar{X} = 73.56\%$ ) were significantly higher than those obtained following shadowing ( $\bar{X} = 65.95\%$ ) ( $F = 3.68$  ;  $p \leq .05$  ; d.f. = 3, 36).

There were no significant differences found between professional interpreters and trainee-interpreters, nor were there any differences found between male and female subjects when examining the mean recognition scores across the four tasks. However, when subjects were asked to listen to a text, male professional subjects performed significantly better ( $\bar{X} = 76.42\%$ ) than female professionals ( $\bar{X} = 70.42\%$ ) ( $t = 3.01$  ;  $p \leq .05$ ). Also, following simultaneous interpretation, male professional interpreters' mean recognition scores were significantly higher ( $\bar{X} = 72.33\%$ ) than those obtained by male beginners ( $\bar{X} = 63.67\%$ ) ( $t = 2.59$  ;  $p \leq .05$ ). (See Table I - 7).

Having looked at the results obtained on the recognition tests as a unit, let us now turn to each type of recognition test involved and in the same order in which they were administered to the subjects: a) lexical recognition; b) semantic recognition and c) word-order recognition tests.



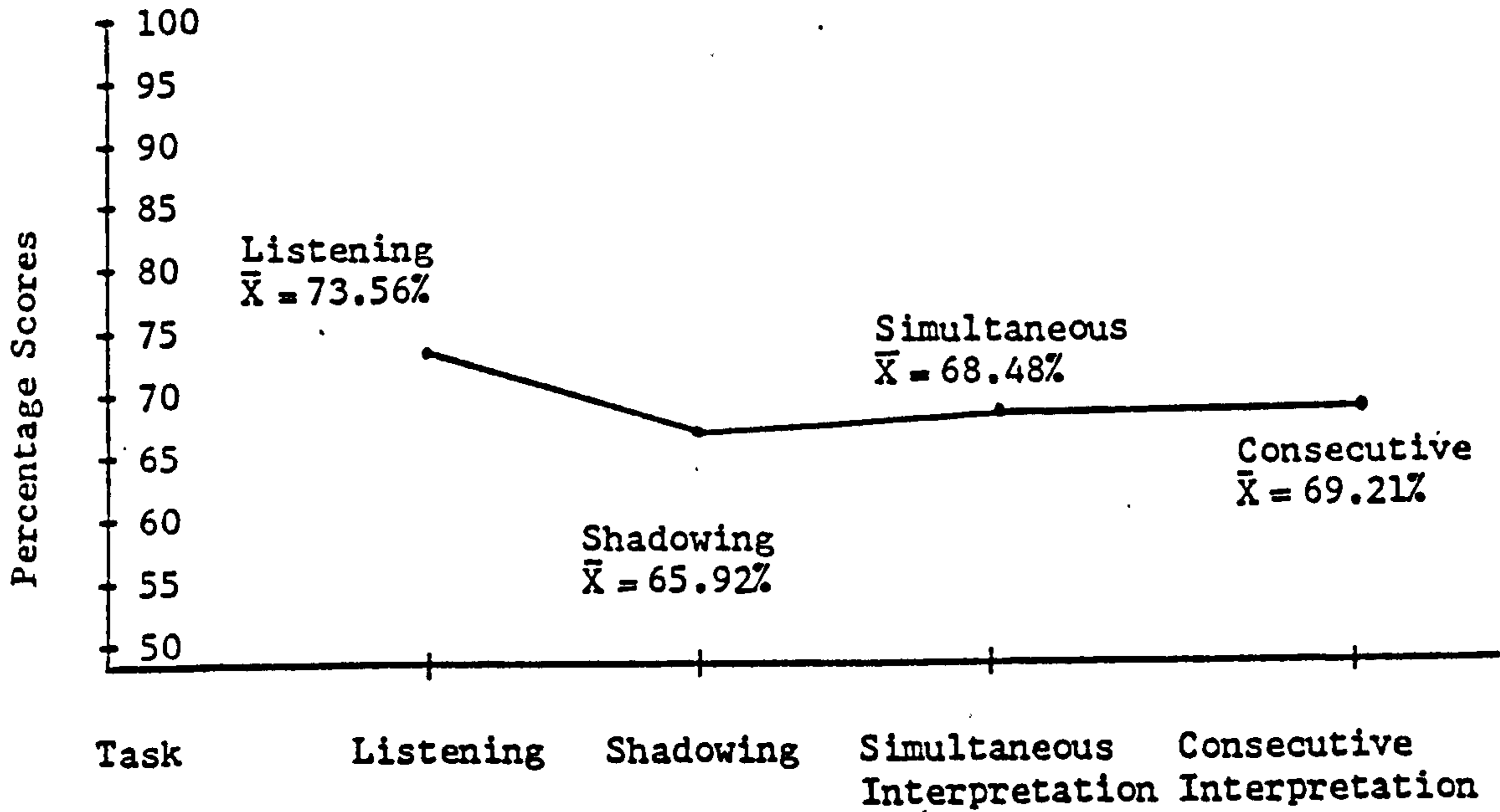


Figure I - 2  
Mean Recognition Scores

Table I - 6

Analysis of Variance of the Mean Recognition  
Scores on all Three Types of Recognition Test.

Source of variation	SS	df	MS	F
<u>SS between S's</u>	<u>1074.14</u>	<u>15</u>	71.61	
Groups	163.605	3	54.54	.72 n.s.
S's within groups	910.535	12	75.88	
 <u>Within S's</u>	 <u>2324.55</u>	 <u>48</u>	 4.68	
A order	47.75	3	15.92	.38 n.s.
B text	174.19	3	58.06	1.37 n.s.
C task	484.74	3	161.58	3.83* $p \leq .05$
residual	97.311	3	32.44	.77
error within	1520.558	36	52.44	
total	3398.689	63		

Means across conditions	Listening		Shadowing		Simultaneous Interpretation		Consecutive Interpretation	
	(n = 32)	(n = 8)	(n = 8)	(n = 8)	(n = 8)	(n = 8)	(n = 8)	(n = 8)
Beginners	$\bar{X} = 68.21\%$ 8.2	73.71%	66.29%	65.25%	67.58%	67.58%	67.58%	9.14
Professionals	$\bar{X} = 70.44\%$ 6.11	73.42%	65.54%	71.71%	71.08%	71.08%	71.08%	5.01
Males	$\bar{X} = 70.45\%$ 7.77	75.25%	66.92%	68.00%	71.62%	71.62%	71.62%	9.12
Females	$\bar{X} = 68.17\%$ 6.82	71.88%	64.92%	68.96%	67.04%	67.04%	67.04%	5.25
Male Beginners	$\bar{X} = 68.44\%$ 8.55	74.08%	63.49%	63.67%	72.49%	72.49%	72.49%	11.96
Female Beginners	$\bar{X} = 67.98\%$ 8.11	73.24%	69.08%	66.83%	62.67%	62.67%	62.67%	1.94
Male Professionals	$\bar{X} = 72.46\%$ 6.56	76.42%	70.34%	72.33%	70.72%	70.72%	70.72%	7.00
Female Professionals	$\bar{X} = 68.41\%$ 5.52	70.42%	60.75%	71.08%	71.42%	71.42%	71.42%	3.06

Table I - 7

Means and Standard Deviations Obtained on the Three Recognition Tests Combined (Lexical-Semantic-Syntactic) Comparing the Scores Combined by Professional, Trainee, Male and Female Interpreters.

Table I - 8

Means and Standard Deviations  
for Each Type of Recognition Test

Type of  
Recognition Measure:

	<u>LEXICAL</u>	<u>SEMANTIC</u>	<u>WORD-ORDER</u>
$\bar{X} =$	69.53%	77.97%	60.47%
S.D. =	10.29	14.16	14.30

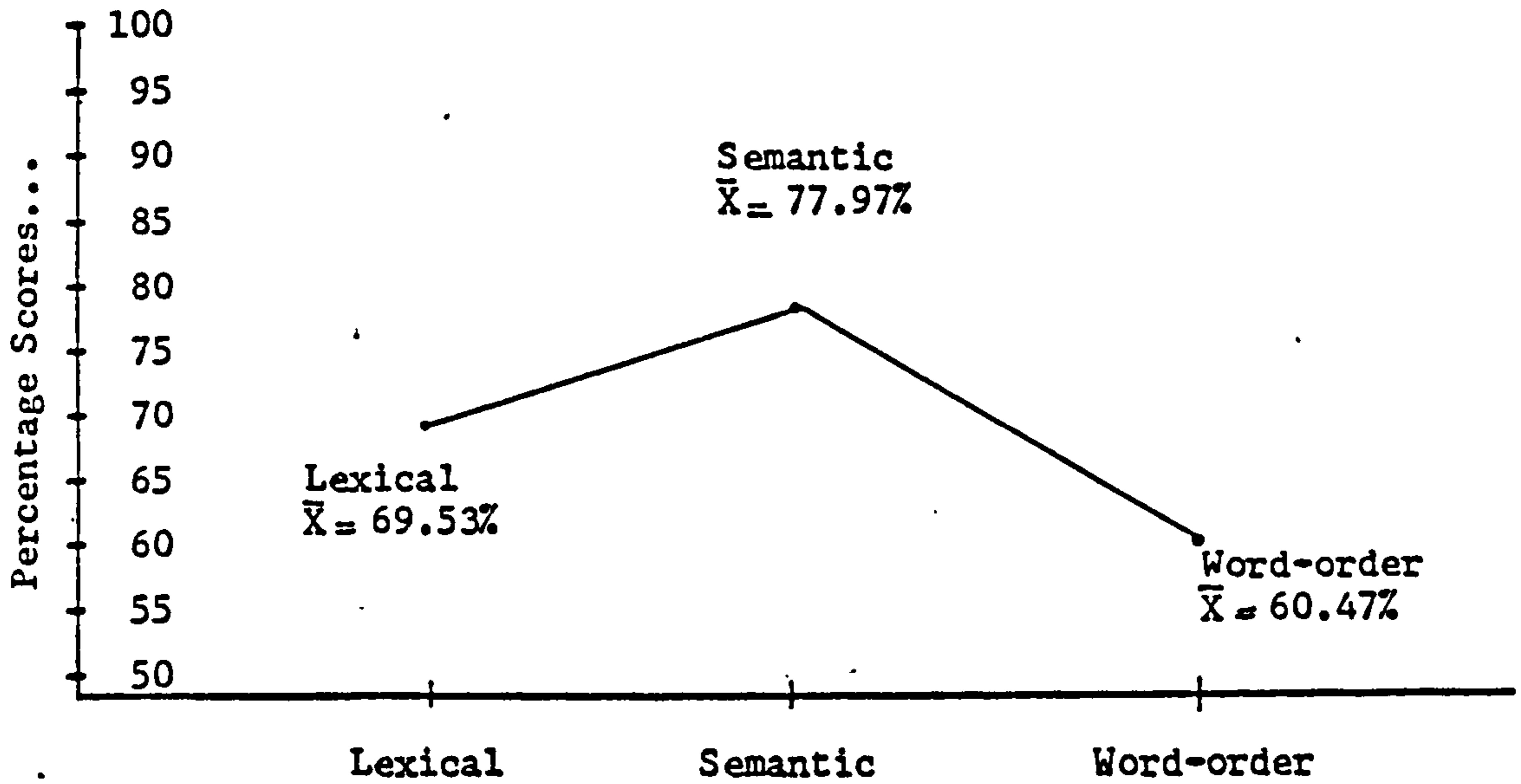


Figure I - 3

Mean Scores Obtained on Three  
Types of Recognition Measures: Lexical,  
Semantic and Word-Order.

Table I - 9

Means and Standard Deviations  
of Lexical Recognition Scores

Recognition measure:  
LEXICAL

Type of task:

	<u>Listening</u>	<u>Shadowing</u>	<u>Simultaneous Interpretation</u>	<u>Consecutive Interpretation</u>
$\bar{X} =$	71.31%	68.38%	69.19%	69.25%
S.D. =	9.65	12.45	11.13	8.26

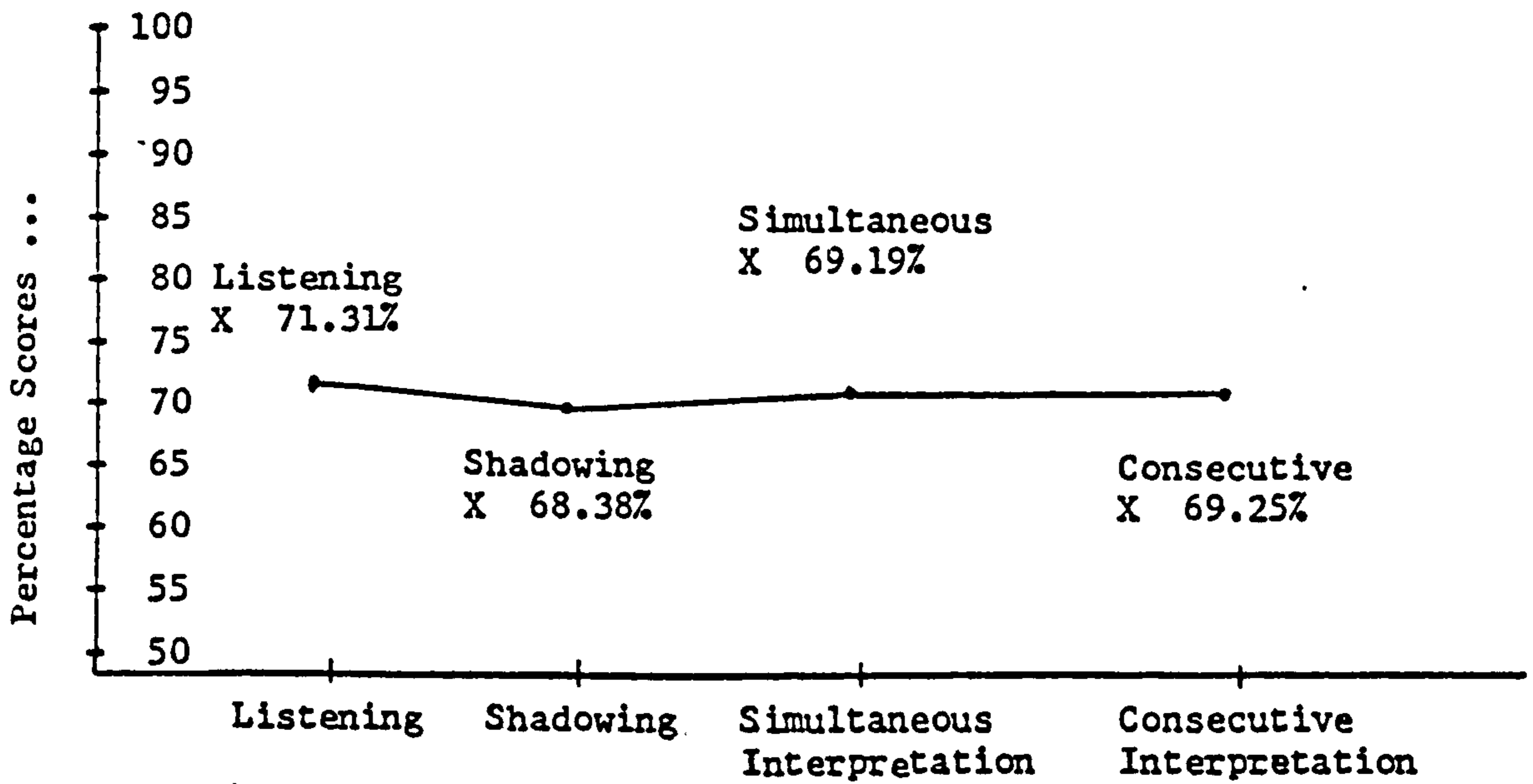


Figure I - 4

Scores Obtained on the Lexical  
Recognition Test According to Task

If we were to examine all the scores obtained on each type of recognition measure without considering the task performed prior to taking the recognition test in question, results indicate that the semantic recognition tests yield the highest mean scores ( $\bar{X} = 77.97\%$ ), followed by the lexical recognition tests ( $\bar{X} = 69.53\%$ ), the difference being highly significant ( $t = 3.85$ ;  $p \leq .001$ ). The lowest scores were obtained on the word-order recognition tests ( $\bar{X} = 60.47\%$ ) which again was significantly lower than either the semantic recognition test ( $t = 6.95$ ;  $p \leq .001$ ) or the lexical recognition test ( $t = 4.11$ ;  $p \leq .001$ ). Table I - 8 gives the means and standard deviations of each type of recognition test, irrespective of the task performed.

Lexical recognition test:

Table I - 9 presents a summary of the scores obtained on the lexical recognition test according to the task required of the subject. An analysis of variance was carried out on the results obtained following the lexical recognition test. It was found that the type of task required of the subject prior to taking the lexical recognition test did not influence the score obtained to any significant degree.

Table I - 11 presents the means and standard deviations for the scores obtained on the lexical recognition test. There were no significant differences found between male and female subjects, nor between professional and trainee-interpreters and the scores they obtained on the lexical recognition test.

Semantic recognition test:

Table I - 12 presents a summary of the results obtained on the semantic recognition test. An analysis of variance was carried out and results indicate that the scores obtained on the semantic recognition test are influenced by the task performed prior to taking the test. Results were significant beyond the .001 level. Scheffé post-hoc tests of multiple comparisons found that recognition scores following listening were



significantly higher (Scheffé  $F = 104.02$  ;  $p \leq .05$ ) than the scores obtained following consecutive interpretation. The consecutive scores were, in turn, significantly higher ( $F = 55.1$  ;  $p \leq .05$ ) than those obtained following simultaneous interpretation ( $\bar{X} = 75.63\%$ ), which in turn were significantly higher ( $F = 123.97$  ;  $p \leq .05$ ) than those obtained after shadowing ( $\bar{X} = 68.14$ ).

Table I - 14 presents the means and standard deviations for the scores obtained on the semantic recognition test by male, female, professional and trainee-interpreters. There were no overall significant differences found between male and female interpreters, nor between professional and trainee-interpreters. However, following listening, male beginners ( $\bar{X} = 95.00\%$ ) obtained higher results than professional male interpreters ( $\bar{X} = 82.50\%$ ) ( $t = 3.27$  ;  $p \leq .05$ ).

Word-order recognition test:

The last recognition test involved measuring interpreters' ability to detect any changes in the order of the sentences which they had processed. Since some of the sentences which served as cues in the word-order recognition test contained part of the answers to the lexical and semantic recognition test, the word-order recognition test was always administered last. For example, one item from the word-order recognition test, 'the idea of building a tunnel is far from new' may have provided the answer tunnel in the word recognition test where subjects were asked whether the word 'cave', 'chasm' or 'tunnel' had appeared in the original. Table I - 15 presents a summary of the scores obtained.

An analysis of variance was carried out on the results obtained following the word-order recognition test and the task required of the subject was found not to have any influence on the score obtained to any significant degree. Once again, the results presented in Table I - 16 show that the only significant main effect was the difficulty in recognizing word-order changes in one of the four stimulus passages and that the task involved when processing that particular passage had no effect on the subsequent recognition score.

Finally, Table I - 17 presents means and standard deviations for the scores obtained on the word-order recognition test by male, female, professional and trainee-interpreters. Although there were no significant overall differences between scores obtained by male and female interpreters, nor between scores obtained by professional and trainee-interpreters, results show that, as a result of listening, male professional interpreters obtained higher scores on the word-order recognition test ( $\bar{X} = 75.00\%$ ) than either female professional interpreters ( $\bar{X} = 55.00\%$ ) ( $t = 2.45; p \leq .05$ ) or male beginners ( $\bar{X} = 55.00\%$ ) ( $t = 2.45; p \leq .05$ ).

Discussion:

Recall and recognition scores will be considered separately.

Recall:

If we examine the results obtained on the recall measures alone, interpreters' scores tend to fall into two distinct categories:

- a) higher scores obtained as a result of the listening and consecutive interpretation tasks (listening,  $\bar{X} = 45.19\%$ ; consecutive interpretation,  $\bar{X} = 45.00\%$ ) on the one hand, and
- b) lower scores following simultaneous ...

(continued on next page.../)

Table I - 10

Analysis of Variance  
Lexical Recognition Test

Source of variation	SS	df	MS	F	
<u>Between S's</u>	<u>2969.94</u>	<u>15</u>	198.00		
Groups	182.81	3	60.94	.26	n.s.
S's within groups	2787.13	12	232.26		
<u>Within S's</u>	<u>3706.00</u>	<u>48</u>	77.21		
A order	278.81	3	92.94	1.09	n.s.
B text	155.19	3	51.73	.61	n.s.
C task	75.31	3	25.10	.30	n.s.
residual	133.81	3	44.60	.52	n.s.
error within	3062.88	36	85.08		
total	6675.94	63			

	Means across Conditions	Listening		Shadowing		Simultaneous Interpretation	
		$\bar{X}$	(n)	%	SD	%	SD
Beginners	$\bar{X} = 70.25\%$ 8.35	$\bar{X} = 72.28\%$ 6.69	(n = 8)	70.13%	9.57	69.50%	10.68
Professionals	$\bar{X} = 68.81\%$ 12.02	$\bar{X} = 70.25\%$ 12.34	(n = 8)	66.63%	15.28	68.88%	12.29
Males	$\bar{X} = 70.72\%$ 11.68	$\bar{X} = 69.50\%$ 12.09	(n = 8)	70.75%	12.75	70.25%	15.15
Females	$\bar{X} = 68.34\%$ 8.72	$\bar{X} = 73.13\%$ 6.74	(n = 8)	66.00%	12.51	68.13%	5.77
Male Beginners	$\bar{X} = 70.94\%$ 8.74	$\bar{X} = 72.25\%$ 8.02	(n = 4)	68.00%	5.23	71.00%	15.25
Female Beginners	$\bar{X} = 69.56\%$ 8.17	$\bar{X} = 72.50\%$ 6.35	(n = 4)	72.25%	13.20	68.00%	5.23
Male Professionals	$\bar{X} = 70.50\%$ 14.33	$\bar{X} = 66.75\%$ 16.03	(n = 4)	73.50%	18.21	69.50%	17.37
Female Professionals	$\bar{X} = 67.13\%$ 9.34	$\bar{X} = 73.75\%$ 8.06	(n = 4)	59.75%	9.32	68.25%	7.09

Table I - 11

Means and Standard Deviations  
for the Lexical Recognition Test for Male,  
Female, Professional and Trainee-Interpreters.

Table I - 12

Means and Standard Deviations  
of The Semantic Recognition Test

Recognition measure:

SEMANTIC

Tasks:

Listening	Shadowing	Simultaneous Interpretation	Consecutive Interpretation
$\bar{X} = 87.50\%$ S.D. = 10.00	68.13% 13.77	75.63% 14.13	80.63% 11.82

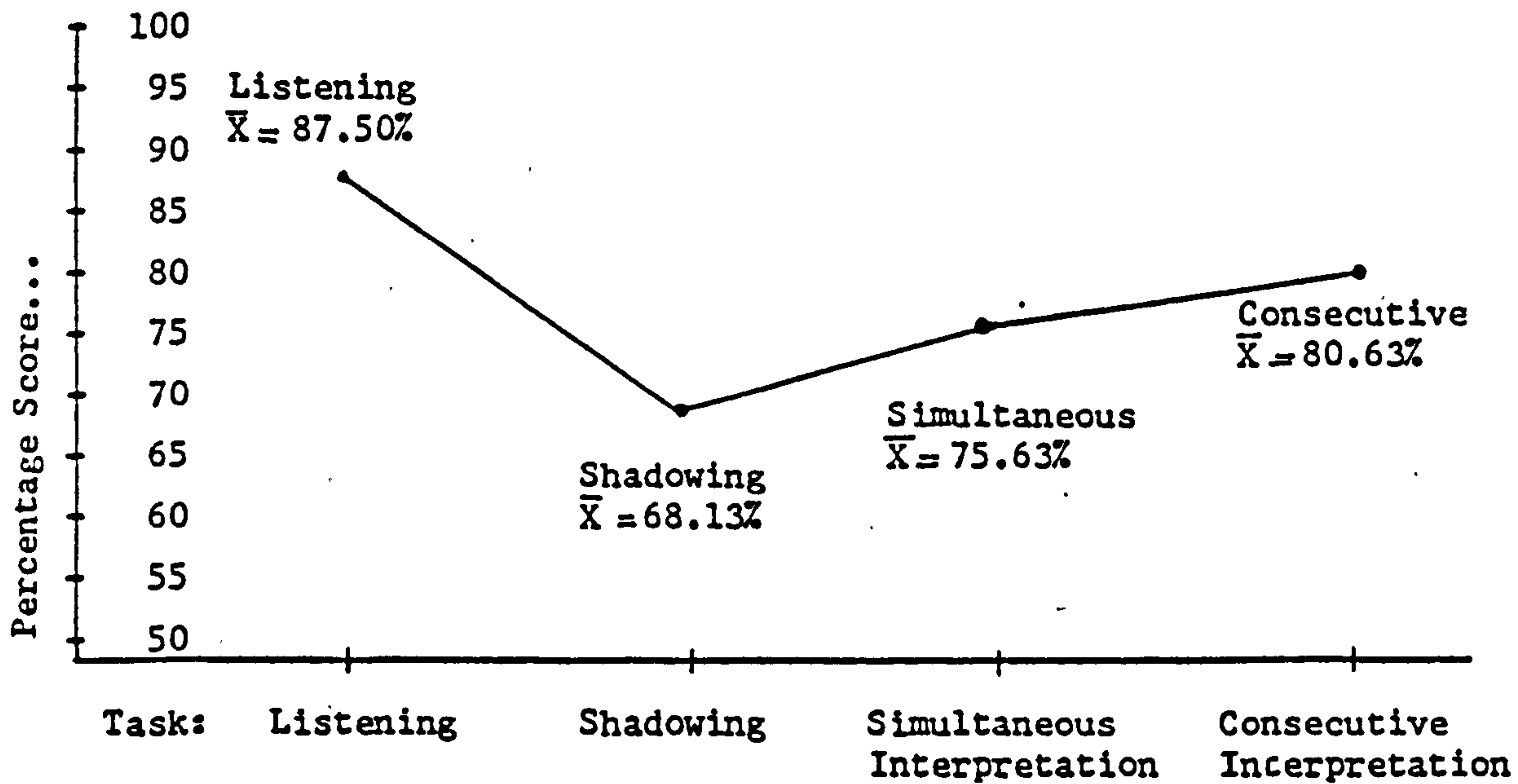


Figure I - 5

Semantic Recognition Scores

Table I - 13

Analysis of Variance for the  
Semantic Recognition Scores

Source of variation	SS	df	MS	F
<u>Between S's</u>	<u>40.609</u>	<u>15</u>	2.71	
Groups	2.297	3	.77	.24 n.s.
S's within groups	38.312	12	3.19	
<u>Within S's</u>	<u>85.75</u>	<u>48</u>	1.70	
A order	.922	3	.31	.26 n.s.
B text	2.797	3	.93	.77 n.s.
C task	32.047	3	10.68	8.83*** p < .001
residual	6.548	3	2.18	1.80 n.s.
error within	43.437	36	1.21	
total	216.36	63		

Means across Conditions	Listening Shadowing Simultaneous Consecutive Interpretation			
	(n = 32)	(n = 8)	(n = 8)	(n = 8)
Beginners	$\bar{X} = 77.19\%$ 16.51	$\bar{X} = 90.00\%$ 10.69	67.50% 16.69	71.25% 18.08
Professionals	$\bar{X} = 78.75\%$ 11.57	$\bar{X} = 85.00\%$ 9.26	68.75% 11.26	80.00% 7.56
Males	$\bar{X} = 79.38\%$ 14.13	$\bar{X} = 91.25\%$ 9.91	68.75% 11.26	75.00% 14.14
Females	$\bar{X} = 76.56\%$ 14.28	$\bar{X} = 83.75\%$ 9.16	67.50% 16.69	76.50% 15.06
Male Beginners	$\bar{X} = 78.75\%$ 17.46	$\bar{X} = 95.00\%$ 5.77	62.50% 12.58	72.50% 20.26
Female Beginners	$\bar{X} = 75.63\%$	$\bar{X} = 85.00\%$ 12.91	72.50% 20.62	70.00% 18.26
Male Professionals	$\bar{X} = 87.50\%$ 10.32	$\bar{X} = 87.50\%$ 12.58	75.00% 5.77	77.50% 5.00
Female Professionals	$\bar{X} = 77.50\%$ 12.91	$\bar{X} = 82.50\%$ 5.00	62.50% 12.58	82.50% 9.57

1  
3  
1

Table I - 14

Means and Standard Deviations  
for the Semantic Recognition Test  
for Male, Female, Professional and Trainee-Interpreters.



Table I - 15

Means and Standard Deviations of  
Scores Obtained on the Word-Order Recognition Test.

Recognition measure:

WORD-ORDER

Tasks:

	Listening	Shadowing	Simultaneous Interpretation	Consecutive Interpretation
$\bar{X}$ =	61.88%	61.25%	60.63%	58.13%
S.D.=	12.76	12.04	15.26	17.59

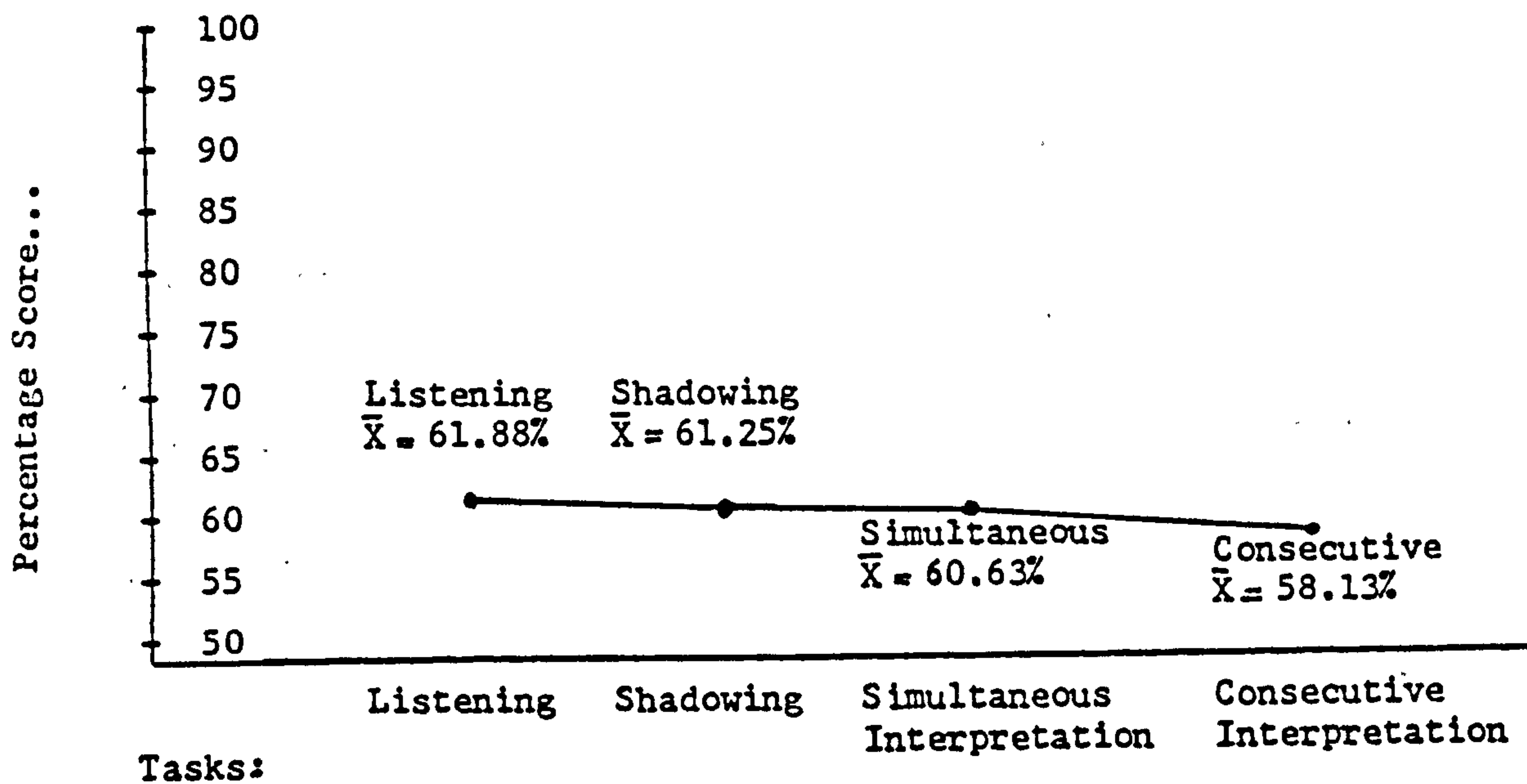


Figure I - 6

Scores Obtained on the Word-Order  
Recognition Test:

Table I - 16

Analysis of Variance  
Word Order Recognition Test

Source of variation	SS	df	MS	F
<u>Between S's</u>	<u>4843.75</u>	<u>15</u>	322.92	
Groups	881.25	3	293.75	.89 n.s.
S's within groups	3962.50	12	330.21	
<u>Within S's</u>	<u>7950.0</u>	<u>48</u>	165.63	
A order	806.25	3	268.75	1.85 n.s.
B text	1518.75	3	508.25	3.48* $p \leq .05$
C task	131.25	3	43.75	.30 n.s.
residual	256.25	3	85.42	.59
error within	5237.50	36	145.49	
total	12793.75	63		

Means across  
Conditions

Listening Shadowing Simultaneous Consecutive  
Interpretation

Beginners	(n = 32)	$\bar{X} = 57.19\%$ 14.64	(n = 8)	$\bar{X} = 58.75\%$ 9.91	61.25% 9.91	55.00% 16.04	53.75% 21.34
Professionals	(n = 32)	$\bar{X} = 63.75\%$ 13.38	(n = 8)	$\bar{X} = 65.00\%$ 15.12	61.25% 14.58	66.25% 13.03	62.50% 12.82
Males	(n = 32)	$\bar{X} = 61.25\%$ 16.41	(n = 8)	$\bar{X} = 65.00\%$ 15.12	61.25% 15.53	58.75% 18.08	60.00% 19.27
Females	(n = 32)	$\bar{X} = 59.69\%$ 12.04	(n = 8)	$\bar{X} = 58.75\%$ 9.91	61.25% 9.35	62.50% 12.82	56.25% 16.85
Male Beginners	(n = 16)	$\bar{X} = 55.63\%$ 15.90	(n = 4)	$\bar{X} = 55.00\%$ 12.91	60.00% 11.55	47.50% 15.00	60.00% 24.49
Female Beginners	(n = 16)	$\bar{X} = 58.75\%$ 13.60	(n = 4)	$\bar{X} = 62.50\%$ 5.00	62.50% 9.57	62.50% 15.00	47.50% 18.93
Male Professionals	(n = 16)	$\bar{X} = 66.88\%$ 15.37	(n = 4)	$\bar{X} = 75.00\%$ 10.00	62.50% 20.62	70.00% 14.14	60.00% 16.63
Female Professionals	(n = 16)	$\bar{X} = 60.63\%$ 10.63	(n = 4)	$\bar{X} = 55.00\%$ 12.91	60.00% 8.16	62.50% 12.58	65.00% 10.00

Table I - 17

Means and Standard Deviations  
for the Word-Order Recognition Test  
for Male, Female, Professional and Trainee-Interpreters.

interpretation and shadowing on the other hand ( $\bar{X}$  = 36.69% and 30.19% respectively).

Consider, if you will, the similarity between shadowing and simultaneous interpretation. Both tasks involve overt vocalization by subjects. Processing times may vary several seconds from shadowing to simultaneous interpretation: for shadowing, subjects were asked to shadow phonemically as opposed to using phrase shadowing techniques (Norman, 1976) although no concrete measures were taken during the experiment. Phrase shadowing techniques would have allowed the shadowers to chunk the incoming message more efficiently and thus facilitate subsequent retention (Chistovitch, Aliakrinskii and Abilian, 1960). Simultaneous interpretation can be compared to phrase shadowing in that the interpreter does, in fact, wait for a sufficient chunk of the input message before beginning to interpret. Phrase shadowing however, does not involve translation, whereas simultaneous interpretation does. Since translation takes time (Hessler, 1966; Oléron and Nanpon, 1965; Treisman, 1965), it is safe to assume that processing time during simultaneous interpretation is longer (in terms of milliseconds) than during shadowing. However, in order to explain the results obtained in the present experiment, both simultaneous interpretation and shadowing scores will be grouped together and compared to the scores obtained following listening and consecutive interpretation.

If we now consider consecutive interpretation, the nature of the task per se is an indication of the processing time involved. The subject performing consecutive interpretation is asked to listen to the incoming message, 1) make notes into English as he is processing the text, 2) make use of these notes by rendering a consecutive delivery of the entire passage, and 3) recall, without the use of notes, in English. Activity number 2 was not included in any of the three other conditions and served as a rehearsal or interpolated task, although it could only have strengthened the mastery of the incoming message. Furthermore, the visual cues provided by the notes acted as another factor which was not present in any of the

three other conditions. However, since the onset of recall following consecutive interpretation was considerably longer in this condition than in the other aforementioned conditions (shadowing and simultaneous interpretation), it could be that this delay may have led to some decay in memory traces instead of strengthening them.

Finally, the processing time involved during listening is left entirely up to the subject. Listening was used as a control condition against which the three other experimental interpretation conditions (shadowing, simultaneous and consecutive interpretation) could be compared. During listening, subjects were simply asked to listen to a French passage and recall it immediately after having heard it. There were no interpolated or ongoing simultaneous activities to be carried out. In other words, the listener was able to devote his full attention to the task. More important, was whether the listener-subject attended to the French message in French and preparing to recall it in English? Or was he processing the French message in English since he knew he was eventually going to recall it in English? The answers to these questions will not be examined in this research. But the fact still remains that the only measure available to determine how much attention the listener paid to the input message is to examine the results obtained on recall scores following that particular task. Results indicate that along with those obtained following consecutive interpretation, listening yielded the highest recall scores, both significantly higher than shadowing but not significantly higher than simultaneous interpretation.

By grouping two tasks together, namely shadowing and simultaneous interpretation, whether because these two tasks represent conditions where there is masking by the subject's own voice (Moray and Underwood, 1971) or simply because processing times are 'shorter' than either listening or consecutive interpretation ( $\bar{X} = 30.19\%$  and  $\bar{X} = 36.69\%$  for shadowing and simultaneous interpreting recall scores respectively), and by comparing these results to those obtained following the longer processing tasks or those tasks where subjects' voices



did not mask or interfere with the ongoing activity, in other words listening ( $\bar{X} = 45.19\%$ ) and consecutive interpretation ( $\bar{X} = 45.00\%$ ), a 't' test performed on the mean percentage scores (see Table I - 19) shows that listening and consecutive interpretation yielded significantly higher scores than shadowing and simultaneous interpretation ( $t = 3.00$  ;  $p \leq .01$ ; d.f. = 63).

If we now compare the results of the present experiment against those obtained by Gerver (1974) in which he asked interpreter-subjects to listen to, interpret simultaneously and shadow French prose passages, the results obtained in his experiment follow the same trend in that listening yielded the highest scores (58%) followed by simultaneous interpretation (51%), followed by shadowing (43%). Gerver's results were significant between tasks in that significantly higher comprehension scores were obtained after listening than after simultaneous interpretation, which in turn yielded significantly higher scores than after shadowing.

The present results follow the same trend in that the scores obtained after listening were significantly higher than those scores following shadowing ( $F = 6.48$  ;  $p \leq .05$ ; d.f. = 3, 36), but there was no significant difference found between scores obtained after listening and simultaneous interpretation, nor between simultaneous interpretation and shadowing. The additional task, consecutive interpretation, was not included in Gerver's study, but results in the present experiment indicate that listening and consecutive interpretation yielded scores that were equally high which would lead one to believe that the amount and type of processing in listening and in consecutive interpretation are approximately the same. This may be the case for recall scores but recognition scores did not yield the same results. In the present experiment, consecutive interpretation yielded scores which were significantly higher than those obtained after shadowing ( $F = 6.31$  ;  $p \leq .05$ ; d.f. = 2, 36).



Recognition:

It has generally been found that under a given set of conditions, estimates of retention are lowest for recall and highest for recognition measures (Luh, 1922; Postman and Rau, 1957). Since the subject does not have to make the responses available but only has to recognize them, recognition usually yields the highest index of retention. In addition to recall measures, it was felt that other aspects of memory should be examined. For example, Sachs (1967) tested syntax recognition after 0, 80 or 160 intervening syllables and found that memory for syntactic changes after 80 or 160 syllables was near the chance level, whereas memory for semantic changes remained high. Therefore, it was decided to examine syntax recognition scores and how each task would affect subsequent recognition scores. Furthermore, Carey (1971) examined listeners' and shadowers' recognition of words and content, in addition to recognition of syntax.

Before examining the results obtained on the individual recognition tests, let us first look at the scores obtained as a whole, in other words, the mean recognition scores of all three types of recognition test (lexical, content and word-order), depending on the task required of the subject (see Table I - 4). An analysis of variance showed that results following listening were significantly higher than those following shadowing ( $F = 3.68$  ;  $p \leq .05$ ;  $d.f. = 3, 36$ ). The same listening vs. shadowing difference was obtained for the recall scores. However, there was no significant difference between the scores following consecutive interpretation and shadowing as had been the case for recall.

The continuum remains the same in that the order followed by the conditions following recall and recognition are parallel: listening is followed by consecutive interpretation, followed by simultaneous interpretation and lastly by shadowing. The only recognition test which yielded any significant results, depending on the task required of the subject beforehand was the semantic reco-

Table I - 18

Means and Standard Deviations  
for the Long and Short Processing Tasks  
or Voice-Masking Factor.

SHADOWING and  
SIMULTANEOUS INTERPRETATION

Short processing times

Voice masking factor

$\bar{X} = 33.44\%$   
S.D.=17.19

LISTENING and  
CONSECUTIVE INTERPRETATION

Long processing times

No voice masking factor

$\bar{X} = 45.09\%$   
S.D.=13.68

gnition test. Neither the lexical or the word-order tests were affected to any significant degree by the type of processing required of the interpreter. In other words, it was the semantic recognition test alone which was significantly influenced by the nature of the task required of the subject. Listening yielded semantic recognition scores that were significantly higher than those following consecutive interpretation, which in turn were significantly higher than those obtained after simultaneous interpretation, which again were higher than those resulting after shadowing. Here the depth of processing continuum clearly differentiated each processing level, beginning with listening as the deepest form, followed by consecutive interpretation, followed by simultaneous interpretation and lastly by shadowing, which once again turned out to be the shallowest form of processing.

The above results were supported by the mean scores obtained on each type of recognition measure without considering the actual task performed prior to the recognition test in question. Results are presented in Table I - 8 and indicate that the semantic recognition measure yields the highest overall mean scores ( $\bar{X} = 77.97\%$ ) which were significantly higher than either the lexical scores ( $\bar{X} = 69.53\%$ ) or the word-order recognition scores ( $\bar{X} = 60.47\%$ ).

These results did not support Carey's shadowing facilitation hypothesis. Carey proposed that since shadowing requires the strategies of listening as a prerequisite but demands additional processing from the subject, retention scores after shadowing would be higher than after listening. Carey hypothesized that when shadowing was successful and when the shadowing response monitored by the subject was identical to the input, then shadowing would improve retention. Carey found that when shadowing a passage recorded at 1 word per second (wps), shadowers tended to have higher retention scores than listeners. At 2 wps, shadowers' scores on word and content measures were still higher than listeners' retention scores but not significantly so. At 3 wps, the difference disappeared for word recognition but went in the opposite direction

for content.

Since the passages in the present experiment were recorded at 1.6 wps. one would expect similar results to those obtained by Carey when his subjects shadowed at 2 wps. Table I - 20 gives the percentage mean scores obtained in both Carey's and the present experiment. Carey's results supported the shadowing facilitation hypothesis when his subjects shadowed at 1 wps and 2 wps where they had time to perceive the words and structure and time to plan and execute shadowing responses. Chistovitch, Aliakrinskii and Abilian (1960) found that when subjects chose to shadow without understanding, they were able to give accurate phonemic reproductions of speech sounds at very short latencies (150 to 250 milliseconds) but could not recall the message they had just shadowed. For those who chose to shadow with understanding however, they repeated the speech latencies at longer latencies (250 milliseconds and up).

Other studies on active or overt vocalization and subsequent retention (Murray, 1965) provide contradictory results: Murray examined the differences between overt and covert repetition of consonant letters and their subsequent effect on recall of these consonants. When no noise was present, he found that recall increased with vocalization. Murray proposed that the more active the rehearsal between presentation and recall, the greater the facilitating effect upon recall. But one must bear in mind that in Murray's experiment, the presentation was visual and not aural. When Murray carried out a similar study in which auditory presentation was compared with visual presentation (Murray, 1965), he found that it made little difference for recall whether the auditory stimulus was self-produced as a result of reading aloud or whether it was externally produced as a result of being delivered in the auditory mode.

Crowder (1970) reports interference and impaired rehearsal due to overt vocalization and offers the following explanations:

"Either a) overt vocalization demands more attention or time than covert vocalization, or b) the paced feature of active vocalization prevented the subject

... continued/

from delaying categorization of elements briefly so as to permit completion of rehearsal loops".

(Crowder, 1970) p. 172

One reasonable hypothesis is that following input of a list in either modality (visual or auditory), the subject rapidly rehearses the series subvocally before engaging in his public retrieval attempt. If this rehearsal loop is accomplished quickly enough (i.e. at a rate of approximately 5 or more elements per second - Landauer, 1962) and silently, then neither temporal decay or displacement by either sounds would empty the contents of the perceptual acoustic storage according to Crowder's model (Crowder, 1970). An additional possibility is that the repetition involved during shadowing simply strengthens the information within the rote level or Stage I level according to the Craik and Lockhart model (1972).

If we now compare the results in the present experiment with those obtained by Gerver (1974), the same order was preserved on the depth-of-processing continuum in that listening yielded the highest mean percentage, followed by simultaneous interpretation and finally by shadowing. Table I - 21 presents the results obtained in both studies.

Contrary to Carey's findings, it would appear that shadowing may not be a form of rehearsal but a mere form of repetition and a shallow form of processing, but nevertheless distracting enough to prevent the shadower from completing the necessary rehearsal loops which guarantee successful recall.

Finally, with regard to possible differences between beginner and professional interpreters on one hand, and differences between the performances of male and female subjects, few differences were uncovered. Recall scores did not yield any significant differences between beginner and professional interpreters nor between male and female subjects, although males tended to obtain somewhat higher scores than females. It might be worthwhile to mention that the experimenter's voice for all the input recordings was that of a female and that for shadowing and simultaneous interpretation, where subjects

Table I - 19

Mean Percentage Scores Obtained  
Following Listening and Shadowing Tasks on  
Word (Lexical) and Content (Semantic) Measures.

CAREY

	<u>Listening</u>		<u>Shadowing</u>	
	word	content	word	content
1 wps	$\bar{X} = 65\%$	81%	68%	84%
2 wps	$\bar{X} = 65\%$	80%	66%	81%
3 wps	$\bar{X} = 63\%$	78%	63%	77%

LAMBERT

	<u>Listening</u>		<u>Shadowing</u>	
	word	content	word	content
1.6 wps	$\bar{X} = 71.31\%$	87.50%	68.38%	68.13%

Table I - 20

Percentage Mean Scores  
Comparisons Across Experiments

GERVER

Comprehension Scores

Listening	58%
Simultaneous Interpretation	51%
Shadowing	43%

LAMBERT

Recall

Semantic Recognition

Listening	$\bar{X} = 45.19\%$	87.50%
Simultaneous Interpretation	$\bar{X} = 36.69\%$	75.63%
Shadowing	$\bar{X} = 30.19\%$	68.13%

have to participate vocally (shadowing or interpreting simultaneously), there may have been less interference for male subjects when shadowing a female voice than for female subjects performing the same task (Moray, personal communication).

By examining each type of recognition test individually, sex and degree of professionalism did not influence the scores obtained on the lexical recognition test. For the semantic recognition test, following listening, male beginners obtained higher results than female professional interpreters to a significant degree. Finally, for the word-order recognition test, once again, following listening, male professional interpreters obtained significantly higher results than both female professionals and male beginners.

When considering the mean recognition scores across the four tasks, male professional interpreters outdid female professional interpreters significantly on listening and male professional interpreters obtained higher scores than male beginners significantly following simultaneous interpretation which neither refuted or supported Moray's suggestion. In general, these may have been chance differences and the main conclusion seems to be that there are no substantial differences between beginners and professionals, male and female interpreters in terms of recall and recognition.

In conclusion, by weighing the retention scores obtained by interpreters following four tasks, namely listening, shadowing, simultaneous and consecutive interpretation, it would appear that deeper processing of incoming material occurs during listening and consecutive interpretation followed by simultaneous interpretation and lastly, by shadowing.

Because the skills developed by simultaneous interpreters are not characteristic of bilinguals in general (more professional bilinguals than social bilinguals), most of the subjects used in the present study were not true bilinguals in that they had acquired their second language long after acquiring their mother-tongue. Therefore, no conclusions were reached regarding the one or two-store model for bilingual memory.



## CHAPTER III

### MONOLINGUAL PROCESSING.

#### Experiment II

This chapter is concerned with interpreters' retention of prose following three experimental tasks: listening, shadowing and consecutive reiteration - as opposed to consecutive interpretation. The experiment was designed as a comparison for Experiment I which included translation as a factor in all four tasks: listening, shadowing, simultaneous and consecutive interpretation, where subjects were asked to process the stimulus input in one language (French) and recall it in another (English). Experiment II eliminates the translation factor in that the stimulus tape is presented in one language (English) and subjects are asked to recall in the same language after performing the processing tasks. By eliminating the translation factor in the present experiment and by comparing scores obtained on the recall and recognition tests to those obtained in the previous experiment, it was hoped to determine whether translation in itself was a factor which would influence the amount and quality of recall following each task. Put another way, the question we are asking is whether there will be any appreciable difference in the amount and type of recall when language of presentation and language of recall are the same.

When examining research carried out on bilingual memory and performance, the bulk of studies has dealt with the degree to which the two languages are separate in memory. There is one approach which claims that there is one single system that taps into two lexical systems by some type of code-switching mechanisms (Kolers, 1963; 1966).

Another view states that there are two separate memory stores and that translation between the two stores creates the only link.

In an experiment conducted by Paivio and Lambert (1981) French-English bilinguals were presented

with a list composed of equal numbers of pictures, French and English words. Subjects were shown these items one at a time and asked to code them by supplying the experimenter with the written English name of each picture, translating each French word into English and simply writing down in English, those words that were presented in English. Following this task, subjects were unexpectedly asked to recall the words they had written. According to Paivio,

"If the concepts that correspond to the bilingual's two languages are in one memory store, recall should be the same whether the word was presented in English or in French. However, if the languages are independent in some strong sense, recall should be higher for the translation condition because both codes are activated during the task and recall could be mediated by either code".

(Paivio and Begg, 1981) p. 13-6

Results indicated that recall in the translating condition was twice as high as recall under the monolingual condition, which lent support to the dual coding hypothesis.

With regard to recalling the pictures, recall in the picture condition was highest of all (51%), exceeding translation (34%), followed lastly by the monolingual coding (17%). One could argue that memory processing is 'deeper' (Craik and Lockhart, 1972) in the picture and bilingual coding conditions than in the monolingual English coding condition. But the superior recall of the picture condition compared to bilingual coding is consistent with the idea that mental images are easier to remember than words (Paivio and Csapo, 1969).

Paivio proposes that:

"The bilingual has verbal representations (logogens) corresponding to words in each language. These are structures as a result of intralinguistic verbal associate experiences, including those related to the different syntactic constraints of the two languages...

... continued/

Representations in each of the sub-systems are activated by the coding task and each class of representational activity leaves a memory trace. The bilingual coding condition primarily activated both French and English logogens via their interconnections in the verbal system... This effectively constituted dual verbal coding, enhancing recall probability relative to the monolingual coding condition, which only involved repeated activation of the same logogens".

(Paivio and Begg, 1981) page 13-6

With regard to a bilingual's language production, research has centered primarily on code-switching and conditions that might create productive interference between the bilingual's two languages, by contrasting, among other things, encoding (production) and decoding (comprehension). Kolers (1966) for example, asked French-English bilingual subjects to read aloud and comprehend unilingual texts in each language, along with mixed language passages. He found that subjects took 20 to 40% longer to read the mixed passages than the monolingual ones. He concluded that code-switching was inhibitory for production but not comprehension, perhaps because the former requires the subject to switch phonological rules whereas comprehension depends on the meanings of the words and not on their linguistic form.

Macnamara (1967) asked bilingual subjects to generate speech by saying as many words as possible in a given time period, monolingually in each language, or by switching languages from word to word without translating, and finally switching by translating words. Macnamara's results indicated that more words were generated in the monolingual condition than in the language or code-switching conditions.

Paivio and Begg (1981) conclude that language switching does appear to take time in both comprehension and production and that such effects constitute evidence that a bilingual's two languages are separate and functionally independent to some degree. To this

effect, if translation requires more time. one would wonder if it also involves additional processing. By comparing the results obtained following Experiment I, where translation was required, with results obtained after Experiment II, where no translation was required, it was hoped to be able to determine the additional amount of processing or effort involved when subjects were asked to process in one language (French) and recall in another (English). In other words, the comparison is being made to find out whether having to translate aids or impairs both recall and recognition.

#### Subjects:

Subjects were nine trainee-interpreters, all students enrolled at the Polytechnic of Central London on the Diploma Course in Conference Interpretation techniques. All subjects had been interpreting for approximately 3 or 4 months. English was the common mother-tongue of all subjects.

#### Experimental Design: (See Appendix Page 321-a)

A 3 X 3 Graeco-Latin Square design was used in an intentional learning paradigm where subjects were asked to 1) listen to, 2) shadow, and 3) reiterate consecutively, three English passages of equal length. Texts and tasks were counter-balanced across subjects. Only nine subjects were necessary in this design.

#### Procedure:

The texts consisted of three English passages, approximately 300 words long, taken from the Unesco Courier and all dealing with various functions of the cerebral hemispheres (see Appendix for actual texts). These texts were selected because all three were originally part of one composite text on language and cerebral dominance, thus making it probable that all texts were equally difficult. Furthermore, they lent themselves easily to

the construction of questions on their factual content, appropriate for the semantic recognition tests and also because they made no special demands on subjects' knowledge of technical vocabularies. The passages were recorded by a female native English speaker, at approximately 1.5 words per second.

Each subject heard the stimulus tape under simulated conference interpretation conditions through stereophonic headphones and their own recall was recorded onto another tape-recorder for subsequent analysis.

Following each condition, subjects were asked to recall, in English, as much as they could remember of the stimulus material presented to them, also in English. When subjects could recall no more, the tape-recorder was turned off and they were then presented with three recognition tests in the following order: 1) word or lexical recognition test; 2) content or semantic recognition test; and 3) word-order or syntactic recognition test.

#### Scoring Procedure:

As explained in more detail in Experiment I, the passages were broken down into a structured list of propositions. Each proposition contained a predicate or relational concept, along with one or more arguments, each fulfilling a semantic function, whether it be agent, object or goal. In order to score recall protocols, the original input text was first broken down into a structured list of propositions and then matched against the transcript of each subject's oral recall, also transcribed in a propositional format and also maintaining the order in which the propositions appeared in the original passage.

#### Results:

Recall and recognition scores will be dealt with separately.

Recall:

Table II - 1 presents a summary of free recall results which were recorded in terms of the correct number of propositional 'idea-units' recalled in percentage form.

A two-way analysis of variance showed that the type of task required of the subject prior to recall clearly influenced his subsequent ability to recall. This effect was found to be significant beyond the .05 level, which indicates, as was found in Experiment I, that one text consistently gave subjects more difficulty when it came to recalling it.

In order to determine which condition had the most significant effect on recall scores, a Scheffé test of multiple comparisons (Guilford, 1973) was carried out. Consecutive reiteration ( $\bar{X} = 44.11\%$ ) yielded recall scores that were significantly higher than those obtained following shadowing ( $\bar{X} = 33.89\%$ ) ( $F = 5.51$ ;  $p \leq .05$ ; d.f. = 2, 21). Although recall scores following consecutive reiteration were somewhat higher than those following listening ( $\bar{X} = 44.11\%$  and  $X = 39.11\%$  respectively), these were not significantly different.

Recognition scores:

Recognition scores will be presented both in terms of the mean scores obtained on all three recognition tests, followed by the results obtained on each individual test, namely lexical, semantic and word-order recognition tests.

Table II - 3 presents a summary of the mean recognition scores obtained on three types of recognition tests as a result of the experimental conditions, that is, listening, shadowing and consecutive interpretation.

An analysis of variance was carried out on the mean scores obtained following all three types of recognition tests and no significant differences were found between the scores obtained

as a result of the task required of the subject. Although in Experiment I, there was a significant difference between listening and shadowing, no such difference came to light in Experiment II. (Table II-4)

#### Types of Recognition Test:

By examining the mean of all the scores obtained after each recognition test, irrespective of the nature of the task which preceded the test, results indicate that both lexical ( $\bar{X} = 79.00\%$ ) and semantic ( $\bar{X} = 79.26\%$ ) recognition tests yielded the highest scores, both significantly higher than the scores resulting from the word-order recognition test ( $\bar{X} = 66.29\%$ ) ( $t = 3.47$  and  $t = 3.43$ ;  $p \leq .01$ , respectively). Table II - 5 presents the means and standard deviations of scores obtained according to the type of recognition measure used, regardless of task.

#### Lexical Recognition Task:

If we now examine each recognition test individually and in the order in which they were administered to the subject, Table II - 6 presents a summary of the results obtained according to the task required of the subject beforehand.

An analysis of variance was carried out on the results obtained following the lexical recognition test. It was found that the type of task required of the subjects prior to taking the recognition test did not influence the score obtained to any significant degree. Table II - 7 presents the main effects.

#### Semantic Recognition Test:

Table II - 8 presents a summary of the results obtained on the semantic recognition test.

An analysis of variance was carried out on the results obtained following the semantic recognition test. It was found that the type of task required did not influence the subsequent score to any significant degree. It is interesting to note that

Table II - 0

Sample of Propositional Scoring for Free Recall

Source-language input in English		Sample of one subject's recall	
<u>Propositional Score</u>	Title: The Hungry Brain		<u>Propositional Score</u>
3	The growth of the human brain	The growth in the human brain	3
2	during gestation	during gestation	2
2	is one of the earliest,	is one of the earliest	2
1	most rapid	the most rapid	1
1	and most extensive	and the most extensive	1
1	developments	forms of growth	1
2	of the whole organism.	in the entire organism.	2
3	Nerve-cell proliferation	The nerve cell.. the nerve cells	2
2	is complete at birth	that a human being has already established at birth	1.5
2	and none of the cells	and they	1
2	are replaced thereafter.	are never replaced.	2
2	After birth	After birth	2
3	the brain continues to grow	the brain grows	2
3	at a much faster rate	at a faster rate	2
3	than the rest of the body	than any other part of the body	3
4	so much so that by the time	and when	1
4	a child is four years old	a child is four years old	4
4	his brain has reached 90%	the brain has already achieved 90%	3
3	of its adult weight	of the weight that it will have in the adult being	3
3	while the rest of the body	whereas the rest of the human body	3
3	has barely made it		0
3	to the 20% mark.	is about 20% or just 20% of the total weight that it will reach in the adult.	3
<u>Total:</u> ..			<u>Total:</u>
56	Input score:	56	44.5
	Output score:	44.5	
	Percentage:	79%	



Table II - 1

Means and Standard Deviations  
of Propositional 'Idea-Units' Recalled

	LISTENING	SHADOWING	CONSECUTIVE REITERATION
$\bar{X}$ =	39.11%	33.89%	44.11%
S.D. =	6.25	14.41	13.71

Percentage Scores

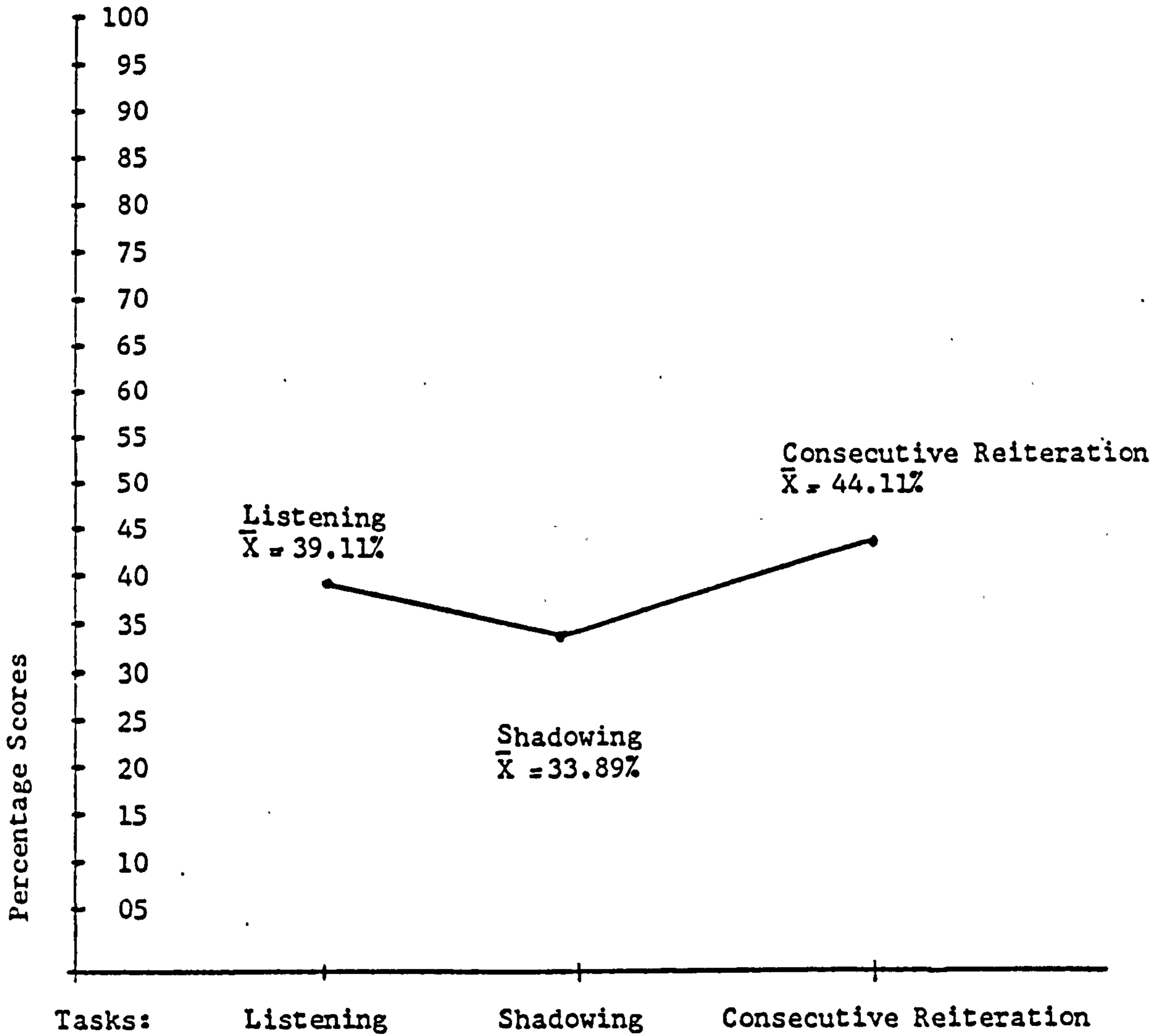


Figure II - 1

Mean Recall Scores

Table II - 2

Analysis of Variance  
Recall Scores

Source of variation	SS	df	MS	F	
<u>Between S's</u>	<u>2448.29</u>	8	306.04		
Groups	406.52	2	203.26	.60	n.s.
S's within groups	2041.78	6	340.30		
<u>Within S's</u>	<u>1500.67</u>	<u>18</u>	83.37		
A order	75.63	2	37.81	.89	n.s.
B text	443.19	2	221.59	5.20*	p < .05
C task	470.29	2	235.15	5.52*	p < .05
residual	0	0			
error (within)	511.156	12	42.63		
total	3948.96	26			

Table II - 3

Means and Standard Deviations  
of Mean Recognition Scores

LISTENING	SHADOWING	CONSECUTIVE REITERATION
$\bar{X} = 74.29\%$	72.67%	77.59%
S.D. = 8.55	9.70	7.39

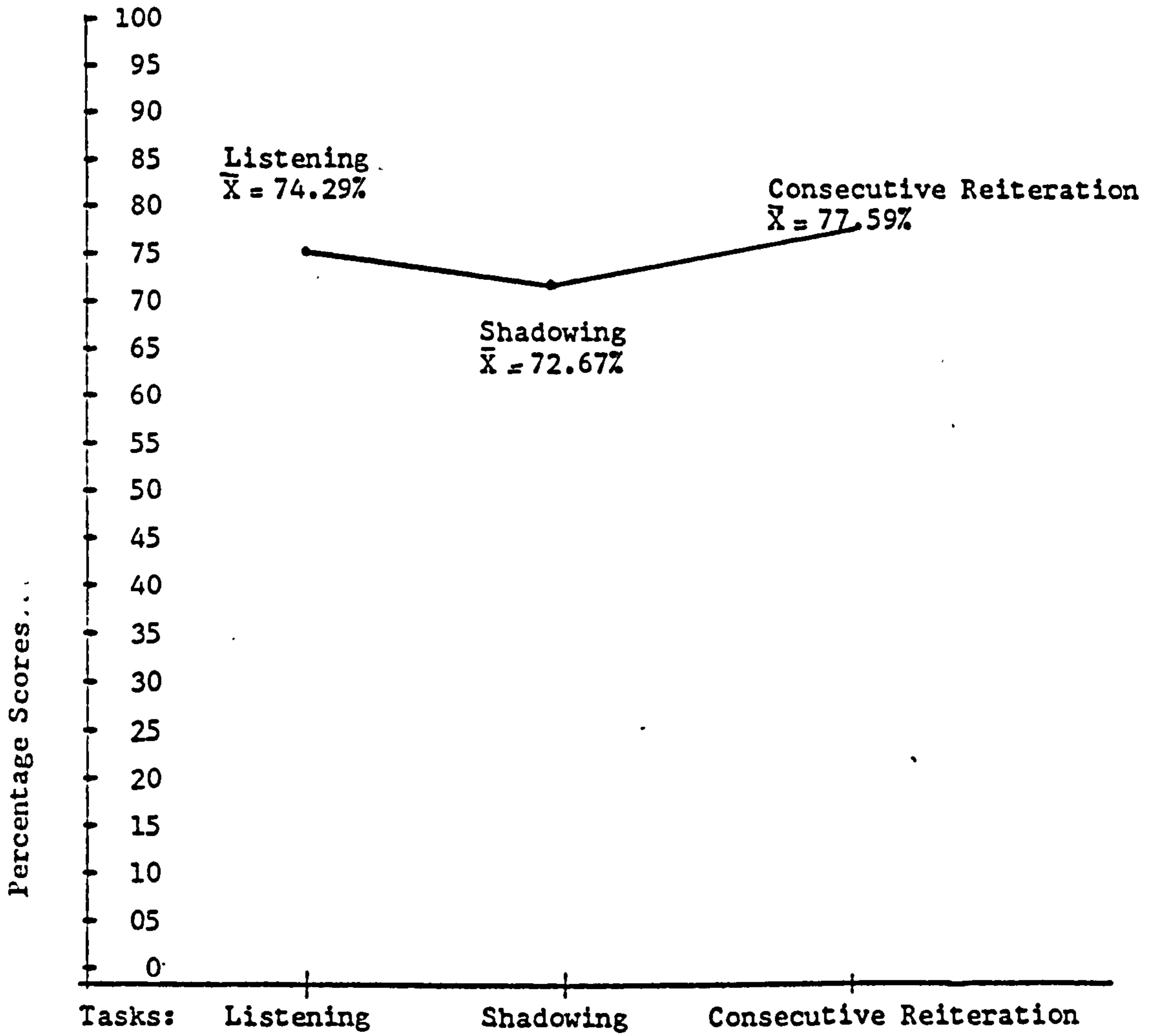


Figure II - 2

Results Obtained on the Three Recognition Tests

Table II - 4

Analysis of Variance on all  
Three Recognition Test Scores

Source of variance	SS	df	MS	F
<u>Between S's</u>	<u>708.21</u>	<u>8</u>	88.53	
Groups	356.002	2	178.00	3.02 n.s.
S's within groups	353.48	6	58.91	
<u>Within S's</u>	<u>1180.48</u>	<u>18</u>	65.68	
A order	6.48	2	3.24	.07 n.s.
B text	512.64	2	256.32	5.60* $p \leq .05$
C task	112.05	2	56.02	1.22 n.s.
residual	0	0		
error (within)	549.31	12	45.78	
total	1889.97	26		

Table II - 5

Means and Standard Deviations  
According to Type of Recognition Test

LEXICAL	SEMANTIC	WORD-ORDER
$\bar{X} = 79.00\%$	79.25%	66.29%
S.D.=10.32	11.41	15.97

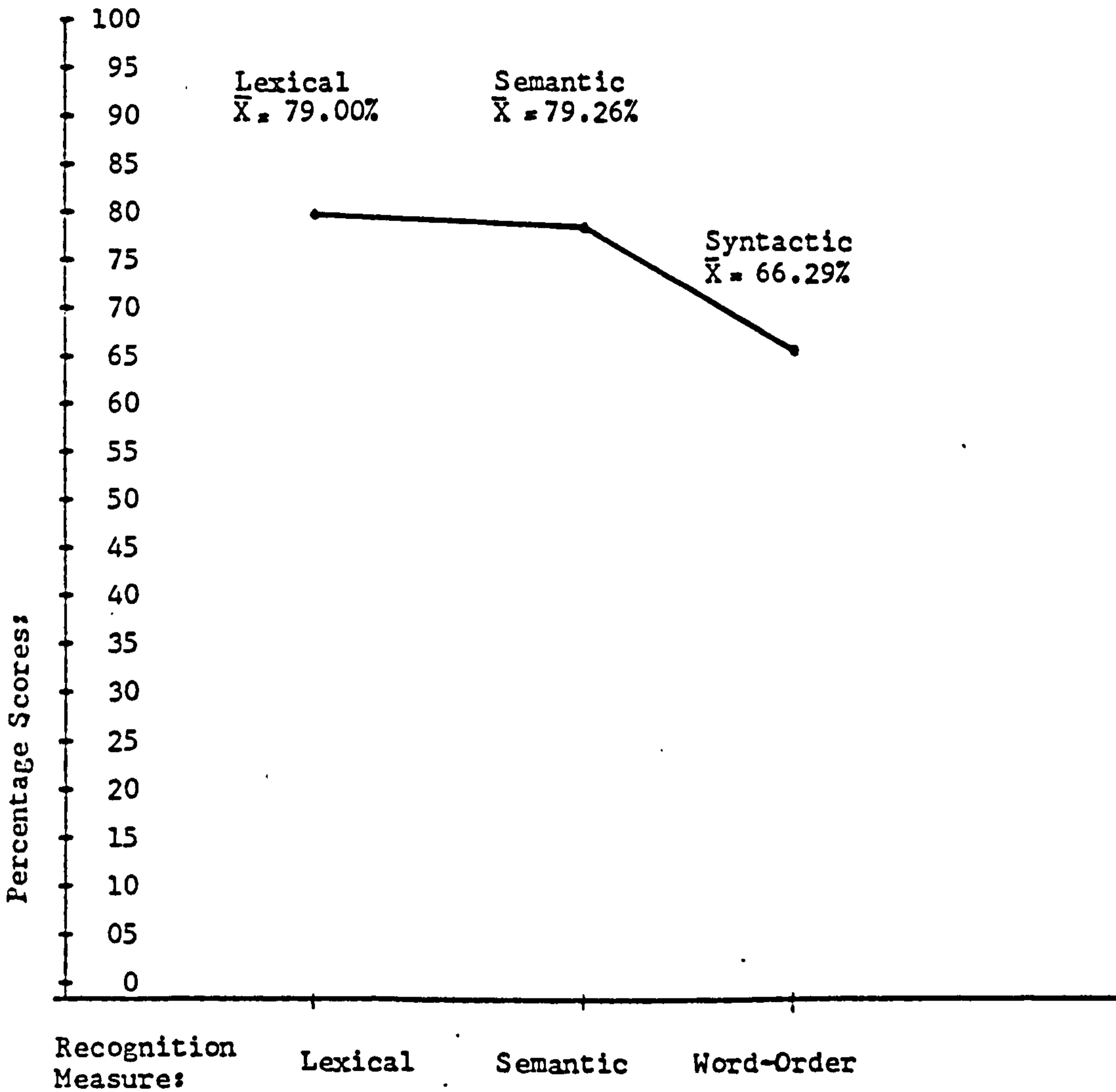


Figure II - 3

Mean Scores Obtained on the Recognition Tests  
According to Type of Test Used



Table II - 6

Means and Standard Deviations of Scores  
Obtained on the LEXICAL Recognition Test

LISTENING	SHADOWING	CONSECUTIVE REITERATION
$\bar{X} = 78.44\%$	74.67%	83.89%
S.D. = 7.57	12.03	9.79

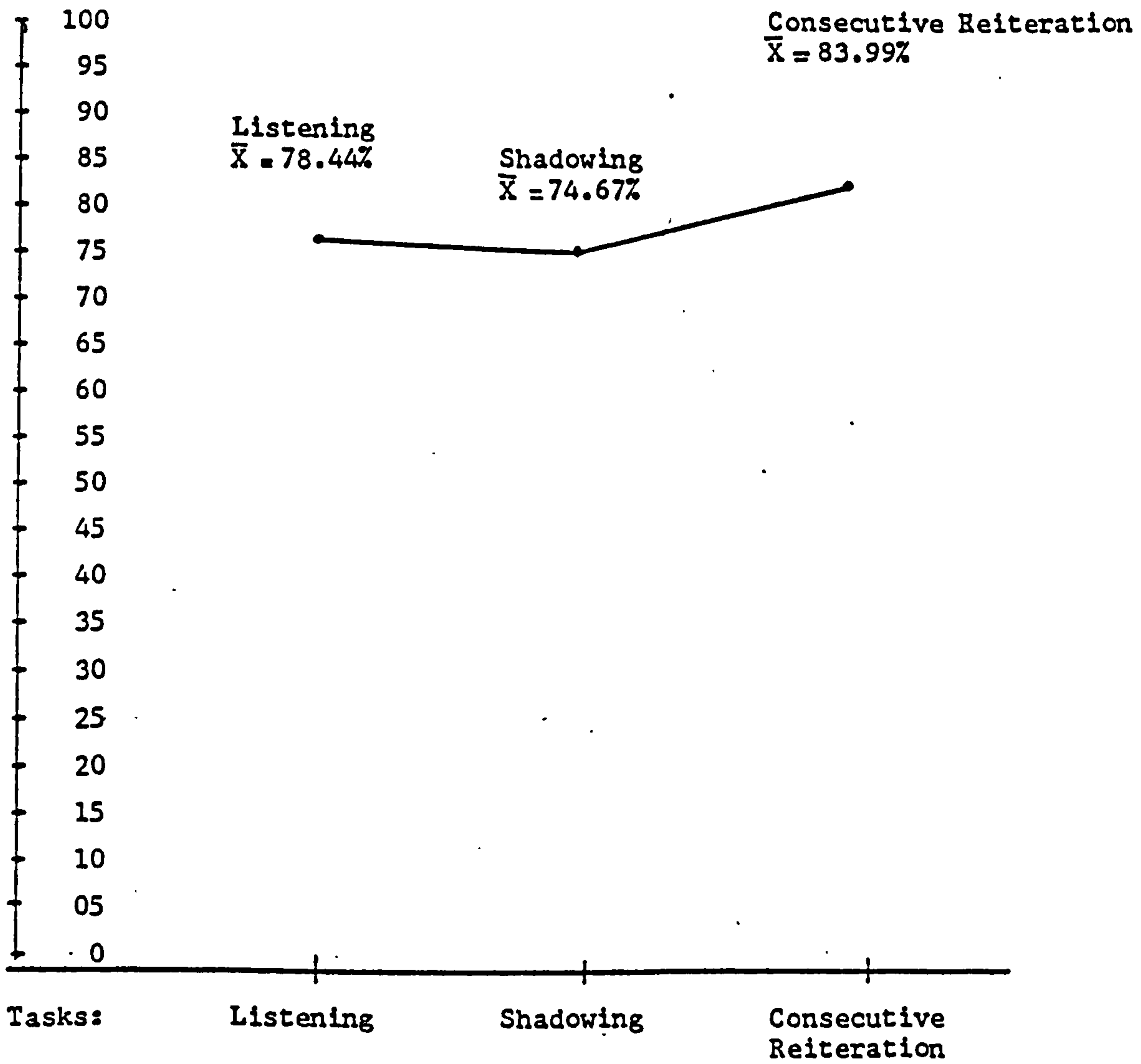


Figure II - 4

Scores Obtained on the LEXICAL  
Recognition Test

Table II - 7

Analysis of Variance  
for the Scores Obtained on the LEXICAL  
Recognition Test

Source of variation	SS	df	MS	F	
<u>Between S's</u>	<u>1314.67</u>	<u>8</u>	164.33		
Groups	440.67	2	220.33	1.31	n.s.
S's within groups	847.00	6	145.67		
<u>Within S's</u>	<u>1455.33</u>	<u>18</u>	80.85		
A order	86.22	2	43.11	.61	n.s.
B text	131.56	2	65.78	.93	n.s.
C task	386.89	2	193.44	2.73	n.s.
residual	0	0			
error within	850.67	12	70.89		
total	2770.00	26			

Table II - 8

Means and Standard Deviations of the Scores  
Obtained on the SEMANTIC Recognition Test

LISTENING	SHADOWING	CONSECUTIVE REITERATION
$\bar{X} = 81.11\%$	77.78%	78.79%
S.D. = 13.64	8.33	12.69

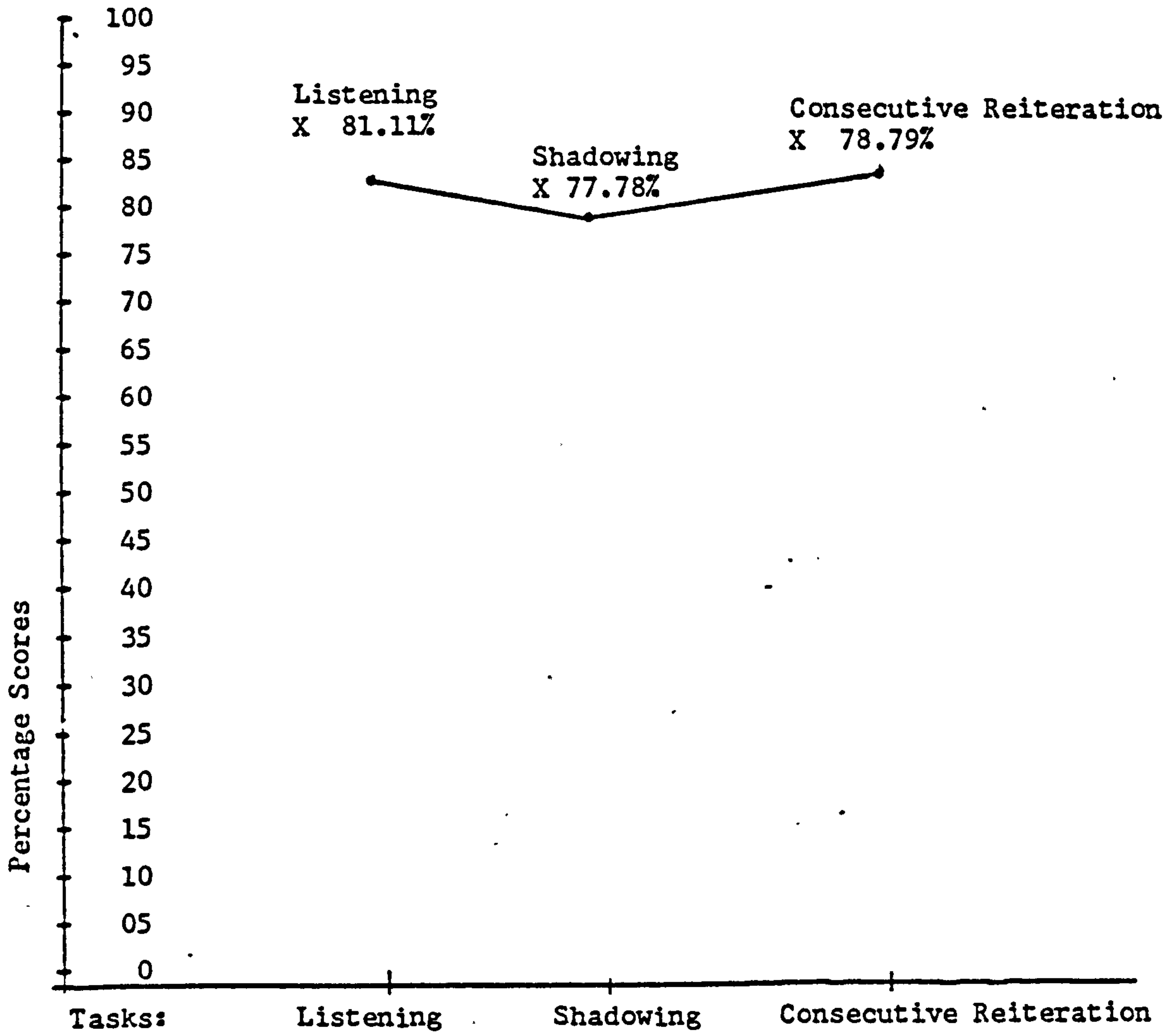


Figure II - 5

Scores Obtained on the SEMANTIC  
Recognition Test

Table II - 9

Analysis of Variance  
SEMANTIC Recognition Scores

Source of variation	SS	df	MS	F	
<u>Between S's</u>	<u>585.18</u>	<u>8</u>	73.15		
Groups	96.29	2	48.15	.59	n.s.
S's withing groups	488.89	6	81.48		
<u>Within S's</u>	2800.00	<u>18</u>	155.56		
A order	562.96	2	281.48	2.24	n.s.
B text	674.07	2	337.04	2.68	n.s.
C task	51.85	2	25.93	.21	n.s.
residual	0	0			
error within	1511.11	12	125.93		
total	3385.19				

in Experiment I, the semantic recognition test was the only test out of the three (lexical, semantic and syntactic) that was sensitive enough to detect any significant difference between the scores following the listening task and the three other tasks. But this difference did not reappear in the present experiment.

The interesting difference between Experiments I and II lay in the fact that the semantic recognition scores were higher for listening and consecutive interpretation ( $\bar{X} = 87.50\%$  and  $\bar{X} = 80.6\%$ ) respectively in Experiment I than in Experiment II ( $\bar{X} = 81.11\%$  and  $\bar{X} = 78.79\%$ , respectively).

#### Word-Order Recognition Test:

Table II-10 presents a summary of the results obtained on the word-order recognition test.

An analysis of variance was carried out on the results obtained on the word-order recognition test and it was found that there were no significant effects found for the task required of the subject prior to the recognition test although a significant text effect did emerge ( $F = 6.47$ ;  $P \leq .05$ ), once again suggesting that one of the texts may have proven to be more difficult than the other two (See Table II - 11).

Although the texts used in Experiments I and II were not the same (since the subjects were sometimes used in both experiments), it is nonetheless interesting to note that no significant differences appeared in Experiment I on the word-order recognition test and that a significant text effect was present.

#### Discussion :

Recall and recognition scores will be discussed separately.

Recall:

If we examine the results obtained on recall measures, consecutive reiteration yielded scores that were significantly higher than those obtained following shadowing. Consecutive reiteration also yielded higher scores than those following listening but these were not significant.

Since there was no translation involved in this experiment, simultaneous interpretation could not be included as one of the conditions. Therefore, the results in the present experiment could not be paired into short vs. long processing tasks or voice masking tasks vs. no voice masking tasks (simultaneous interpretation and shadowing vs. listening and consecutive interpretation) as had been done in Experiment I.

A direct comparison between the results obtained following Experiment I and Experiment II will not be possible in this discussion since the texts used for both experiments were not the same and therefore any differences found may simply be due to a text difference. However, since the subjects used in both experiments were the same, and since the nature of tasks were similar, several conclusions can safely be drawn at this point.

By examining the results obtained in Experiment I where translation was required of subjects and those obtained in Experiment II where no translation was required, results as shown in Table II - 13 seem fairly similar for both shadowing ( $\bar{X} = 30.19\%$  and  $33.89\%$  respectively), as well as consecutive interpretation for Experiment I ( $\bar{X} = 45.00\%$ ) and consecutive reiteration for Experiment II ( $\bar{X} = 44.11\%$ ). The similarity lies in the fact that scores obtained following consecutive interpretation and consecutive reiteration were somewhat higher than those obtained following shadowing. Where scores differed, however, was following listening where recall scores were higher in Experiment I ( $\bar{X} = 45.19\%$ ) than in Experiment II ( $\bar{X} = 39.11\%$ ). This difference, however, was not



Table II - 10

Means and Standard Deviations  
For the Word-Order Recognition Scores

	LISTENING	SHADOWING	CONSECUTIVE REITERATION
$\bar{X}$ =	63.33%	65.56%	70.00%
S.D. =	16.58	18.10	14.14

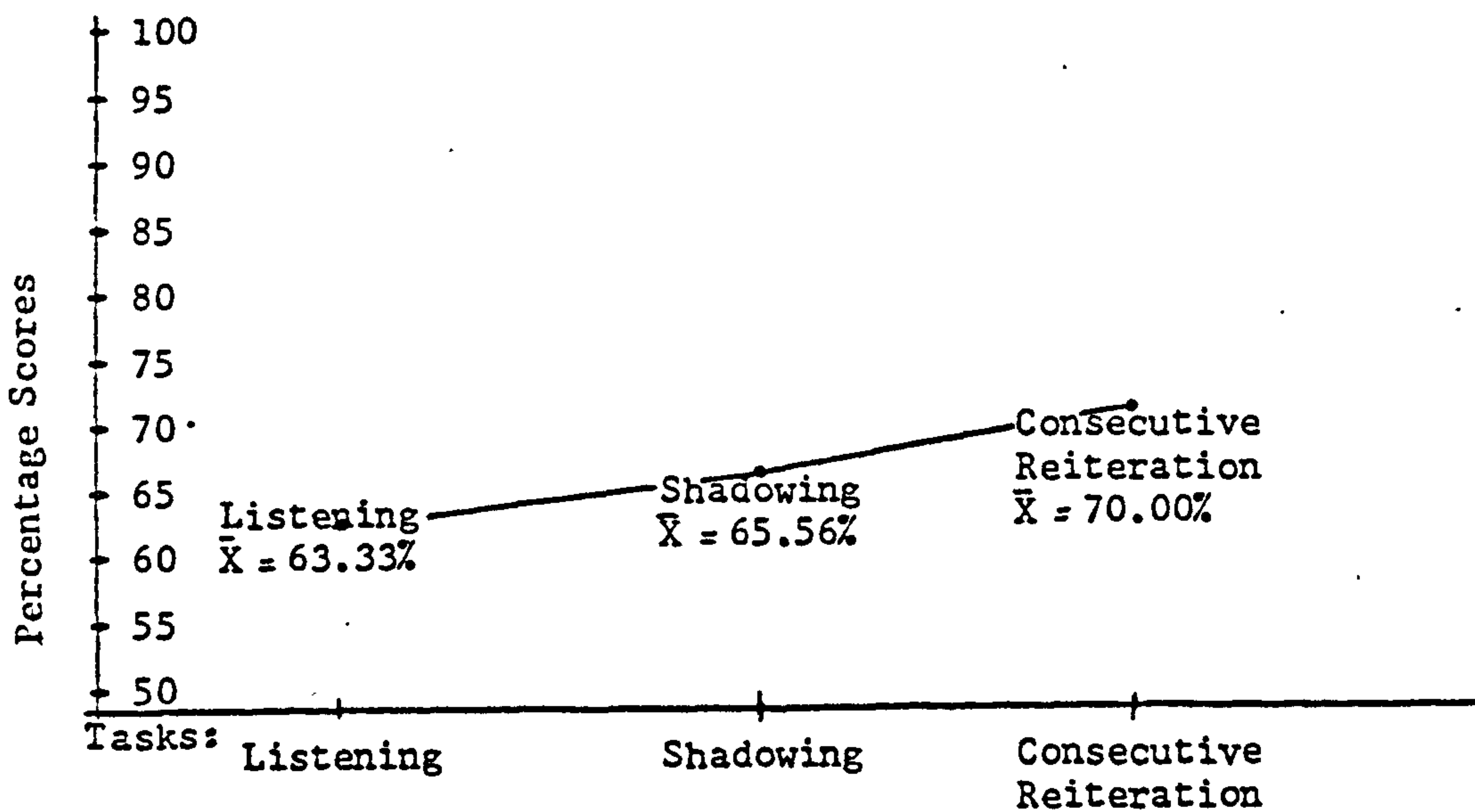


Figure II - 6  
Scores Obtained on the Word-Order  
Recognition Test

Table II - 11

Analysis of Variance  
Word Order Recognition Test

Source of variation	SS	df	MS	F	
<u>Between S's</u>	<u>2362.96</u>	<u>8</u>	295.37		
Groups	807.41	2	403.70	1.56	n.s.
S's within groups	1555.55	6	259.26		
<u>Within S's</u>	<u>4266.67</u>	<u>18</u>	355.56		
A order	362.96	2	181.48	1.22	n.s.
B text	1918.52	2	969.26	6.46*	$p \leq .05$
C task	207.41	2	103.70	.70	n.s.
residual	0	0			
error within	1777.78	12	148.15		
total	6629.63	26			

Table II - 12

Recall Scores

Obtained in Experiment I and II

	Experiment I with translation	Experiment II without translation
LISTENING	$\bar{X} = 45.19\%$	$\bar{X} = 39.11\%$
SHADOWING	$\bar{X} = 30.19\%$	$\bar{X} = 33.89\%$
CONSECUTIVE	INTERPRETATION $\bar{X} = 45.00\%$	REITERATION $\bar{X} = 44.11\%$
SIMULTANEOUS INTERPRETATION	$\bar{X} = 36.69\%$	_____

Table II - 13

Comparison of Recall Scores  
For Experiments I and II

	Experiment I	Experiment II	't' test
Listening	X = 45.19%	X = 39.11%	.99 n.s.
Shadowing	X = 30.19%	X = 33.89%	.46 n.s.
Simultaneous Interpretation			
Consecutive Interpretation	X = 45.00%	X = 44.11%	.23 n.s.

significant (See 't' test, Table II - 13).

When examining the difference between recalling a passage presented in a foreign language (French) and in one's native tongue (English), subjects tended to recall the same amount of material.

In an experiment exploring the effect of sequential constraints on speech transmission tasks, Treisman (1965) asked her subjects to shadow passages in a native and in a foreign language. Treisman found that the source language passage had a significant effect on the English and on the French subjects but not on her group of bilingual subjects. In other words, with the foreign language, there was a constant decrement over all passages. More interesting however, was her finding that when comparing results obtained following shadowing and simultaneous interpretation, Treisman found that by asking her subjects to translate, their efficiency decreased proportionally more for the passages of high information content.

Although Treisman was measuring an immediate decrement due to translation and the present experiment measures recall and recognition after the passage has been presented, the results obtained in Experiment II partially support Treisman's findings in that 1) when the stimulus material was presented in the subjects' foreign language and when simply asked to listen, recall scores were somewhat higher than when the message was presented in the mother-tongue. Generally speaking, though, language of presentation did not seem to affect the amount of recall in the present experiment, whereas there was a clear advantage for Experiment II over Experiment I for recognition scores.

Contrary to Treisman's findings, however, and judging from the results obtained in Experiment I, 2) recall scores were somewhat higher following

simultaneous interpretation than after shadowing. Although these results were not quite significant, they certainly did not follow Treisman's opposite trend. However, since several subjects who had served in Experiment I were also used in Experiment II, different texts had to be used as stimulus material. Some of the differences obtained in the recall scores may be attributed to this different text effect.

A study by Dornič (1977) involved incidental learning conditions where subjects attended to a task requiring active use of one language while being incidentally exposed to information not requiring attention, either in one language or in the other. Results indicated that under certain conditions, bilinguals remembered much more of the incidental information when its language was congruent with that used in the primary task than when it was not. In other words, processing in one language was greatly reduced when the other was strongly involved in a task, as if a language mechanism switch had been turned off. The results obtained in the present study do not support Dornič's findings, although comparing tasks across studies is delicate: one could hypothesize that shadowing a French passage in French and then recalling it in English (as was the case in Experiment I of the present study), compared to shadowing an English passage in English and then recalling it also in English (Experiment II of the present study) is somewhat similar to Dornič's procedure. Results in the present experiment showed that recall scores following shadowing in Experiment I with translation ( $\bar{X} = 30.19\%$ ) and following shadowing in Experiment II without translation ( $\bar{X} = 33.89\%$ ) were not significantly different.

Kolers (1966) examined the performance of bilinguals when asked to read and produce spontaneously passages where two languages were mixed. He found that although speeds for reading and spontaneous production were much slower for the mixed texts,

their comprehension was in no way impaired. The production data enables Kolers to calculate a phonological code-switching time of about .3 to .5 seconds for different subjects. The estimates were longer (about 1.3 seconds) when subjects freely generated mixed (as opposed to monolingual) speech or summarized the text they had read. Kolers concluded that such code-switching may be inhibitory for production, but that comprehension was not affected, possibly because the former requires the subject to switch phonological rules, whereas comprehension depends on the meanings of the words and not on the linguistic form.

Since there were no significant differences found in recall scores whether translation was required of the subjects or not, the results would support the notion that the bilingual's two languages are in one memory store.

#### Recognition:

Table II - 14 presents the mean scores obtained on all three recognition tests.

In Experiment I, it was found that the highest scores were obtained following listening, followed by consecutive interpretation; then simultaneous interpretation and finally, by shadowing. In other words, listening was at one end of the continuum and shadowing, at the other end.

In Experiment II, consecutive reiteration ( $\bar{X} = 77.59\%$ ), not listening ( $\bar{X} = 74.29\%$ ) yielded the highest mean recognition scores, followed by listening ( $\bar{X} = 74.29\%$ ) although this difference was not significant, followed by shadowing ( $\bar{X} = 72.67\%$ ). In Experiment I however, there was a significant difference between the scores obtained following listening ( $\bar{X} = 73.56\%$ ) and those obtained following shadowing ( $\bar{X} = 65.92\%$ ) ( $F = 3.68$  ;  $p \leq .05$ ; d.f. = 3, 36).



As was the case for recall scores, recognition scores seem to follow a similar pattern in that when there is no voice-masking present in the task required of the subject and when a language switch does occur, in other words when the language of presentation is French and the language of recall is English, both recall and recognition scores are highest following listening. However, when the language of presentation and the language of recall are the same (English), there are no significant differences between conditions although scores are somewhat higher as a result of consecutive reiteration. A language-switch situation (listening to a passage in French and recalling it in English) albeit a passive situation, where there is no voice-masking present and where the subject is allowed to devote his full attention to the incoming message will yield the highest recognition scores as well as recall scores.

By comparing the mean recognition scores between Experiment I (language switch) and Experiment II (same language), no significant differences were found between the mean recognition scores obtained when subjects were simply asked to listen to a French passage and answer a series of recognition tests in the same language (Experiment I,  $\bar{X} = 73.56\%$ ) and when subjects were asked to attend to an English passage and answer recognition tests in the same language (Experiment II,  $\bar{X} = 74.29\%$ ). Following consecutive reiteration however, overall recognition scores were significantly higher when no language-code switching was required of the subject. In other words, when <sup>the</sup> subject performed a consecutive reiteration task on an English passage, rendered a delivery or reiteration in English, recalled the original passage in English, overall recognition scores were significantly higher than when the subject performed a consecutive interpretation on a French passage by taking consecutive notes in English, giving a consecutive interpretation in English, recalling it in English

Table II - 14

Recognition Mean Scores  
Following Experiment I (With Translation)  
and Experiment II (No Translation)

	<u>Experiment I</u>	<u>Experiment II</u>
LISTENING	$\bar{X} = 73.56\%$	$\bar{X} = 74.29\%$
SHADOWING	$\bar{X} = 65.92\%$	$\bar{X} = 72.67\%$
CONSECUTIVE	INTERPRETATION $\bar{X} = 69.21\%$	REITERATION $\bar{X} = 77.59\%$
SIMULTANEOUS INTERPRETATION	$\bar{X} = 68.48\%$	_____

and finally answering a series of recognition tests in French ( $\bar{X} = 77.59\%$  and  $\bar{X} = 69.21\%$ ;  $t = 2.75$  ;  $p \leq .05$ ). Once again, since the texts used in Experiments I and II were not the same, any difference may be attributable to this fact.

Table II - 15 presents each type of recognition test individually for both experiments, beginning with the lexical recognition test. Results indicate that consecutive reiteration yielded the highest mean scores ( $\bar{X} = 83.89\%$ ), followed by listening ( $\bar{X} = 78.44\%$ ) and finally by shadowing ( $\bar{X} = 74.67\%$ ). However, there were no significant differences between these scores. In Experiment I, where language code switching was present, listening yielded the highest mean recognition scores ( $\bar{X} = 71.31\%$ ), followed by consecutive interpretation ( $\bar{X} = 69.25\%$ ) and finally by shadowing ( $\bar{X} = 68.38\%$ ). Again, results were not significantly different but it is nevertheless interesting to note that they follow the same continuum as those obtained with recall measures in that consecutive reiteration yielded the highest scores, followed by listening, and lastly by shadowing.

If we now compare the lexical recognition results between Experiment I (language code switching) and Experiment II (same language), all three results in Experiment II were higher than those obtained in Experiment I. These results were not significant following shadowing, but as a result of both listening ( $t = 2.04$  ;  $p \leq .05$ ) and consecutive reiteration ( $t = 3.79$   $p \leq .001$ ), results were significantly higher in Experiment II where no language switch was present.

Language code switching, present in Experiment I and absent in Experiment II may account for these significant differences although this was not the case for recall. In Experiment II, passages were presented in English, recall was performed in English and recognition tests were also carried out in English. There was no code switching at any time in this experiment.

Table II - 15

Lexical Recognition Scores  
for Experiment I and Experiment II

Experiment I Language Switch		Experiment II No Language Switch	
LISTENING	$\bar{X} = 71.31\%$		$\bar{X} = 78.44\%$
SHADOWING	$\bar{X} = 68.38\%$		$\bar{X} = 74.67\%$
CONSECUTIVE INTERPRETATION	$\bar{X} = 69.25\%$	REITERATION	$\bar{X} = 83.89\%$

Table II - 16

Semantic Recognition Scores  
for Experiment I and Experiment II

	Experiment I Language Switch	Experiment II No Language Switch
LISTENING	$\bar{X} = 87.50\%$	$\bar{X} = 81.11\%$
SHADOWING	$\bar{X} = 68.13\%$	$\bar{X} = 77.78\%$
CONSECUTIVE INTERPRETATION	$\bar{X} = 80.63\%$	$\bar{X} = 78.79\%$
		REITERATION

Consider what happened, by contrast, in Experiment I: the passages were presented in French and subjects were asked to recall in English (language code switching 1). Following recall, subjects were immediately presented with a series of recognition tests, all of which were in the same language as that of presentation, namely French (language code switch 2).



Although in Experiment I, both input and recognition tests were presented in the same language, the interpolated activity consisted of a recall test which required the subjects to recall and translate the input into English, thus obliging them to switch back into French for the recognition tests. Experiment II required no such language code switch and consequently recognition scores were significantly higher than those obtained in Experiment I. If we examine the recall scores, there was only one language code switch in Experiment I, since subjects processed a French passage and recalled it in English, which accounts for one language switch and not two, as is the case when subjects are presented with recognition tests. Recall scores in Experiment II did not differ to any significant degree from recall scores in Experiment I.

Table II - 16 presents the mean recognition scores on the semantic recognition test for both Experiments I and II. Results indicate that the highest recognition scores were obtained

following listening for Experiment II ( $\bar{X} = 81.11\%$ ) followed by consecutive reiteration ( $\bar{X} = 78.79\%$ ), and, lastly by shadowing ( $\bar{X} = 77.78\%$ ). There were no significant differences between these scores, however. Nevertheless, it is interesting to note that for recall, mean recognition scores and lexical recognition, the highest recognition results always came as a result of consecutive reiteration, whereas for semantic recognition scores, the highest results came following listening. The hierarchy was the same for Experiment I in that listening yielded the highest semantic recognition scores, followed by consecutive interpretation and lastly by shadowing.

If we now compare the semantic recognition scores following Experiment I (language switch) against those obtained in Experiment I, the only significant difference was found after shadowing (Experiment I,  $\bar{X} = 68.13\%$ ; Experiment II,  $\bar{X} = 77.78\%$ ;  $t = 2.18$ ;  $p \leq .05$ ). Note that in the two other conditions, listening and consecutive, scores tended to be somewhat higher in Experiment I where subjects were exposed to the double language code switch. Results went in the opposite direction and significantly so for shadowing in that results were superior on the semantic recognition test when subjects shadowed a passage in English, recalled it in English and took the semantic recognition test also in English.

Table II - 17 presents the mean recognition scores for the word-order recognition test for both Experiments I and II. In Experiment II, where no language switch was involved, the highest recognition scores came after consecutive reiteration ( $\bar{X} = 70.00\%$ ) followed by shadowing ( $\bar{X} = 65.56\%$ ) and lastly by listening ( $\bar{X} = 63.33\%$ ). These results were not significantly different but it is interesting to note that shadowing did not yield the lowest set of scores.

Table II - 17

Word-Order Recognition Scores  
for Experiment I and Experiment II

	<u>Experiment I</u> Language Switch	<u>Experiment II</u> No Language Switch
LISTENING	$\bar{X} = 61.88\%$	$\bar{X} = 63.33\%$
SHADOWING	$\bar{X} = 61.25\%$	$\bar{X} = 65.56\%$
CONSECUTIVE INTERPRETATION	$\bar{X} = 58.13\%$	$\bar{X} = 70.00\%$ REITERATION



When comparing the results obtained in Experiment II where no translation was involved and those obtained in Experiment I; there were no significant differences as a result of listening and shadowing. Results approached significance following consecutive reiteration in that word-order recognition scores were somewhat higher when subjects did not have to switch language codes.

Although there was a slight if insignificant advantage for Experiment I over Experiment II for recall scores, there was a clear advantage for Experiment II over Experiment I for recognition scores. This suggests that recall, which requires organization and reconstructive operation to be carried out and where depth of processing is not hindered by translation, is, on the contrary even slightly helped by it. On the other hand, recognition, which relies on more accurate verbatim encoding, is disrupted by processes which ignore the precise form of words in favour of their meaning. The fact that the semantic recognition scores were actually higher for listening and consecutive interpretation in Experiment I than for Experiment II lend support to this notion.

## CHAPTER IV

### THE ROLE OF CONSECUTIVE NOTES:

#### Experiment III

This chapter deals specifically with one aspect of interpretation, namely consecutive interpretation. Consecutive interpretation differs from simultaneous interpretation in that the interpreter makes notes concurrently with the speaker and then delivers the interpretation once the speaker either pauses or at the end of his speech. Consecutive interpretation also differs from the type of note-taking by a student during lectures because the notes are exclusively intended for immediate use, to serve as reminders in a speech which is still fresh in the interpreter's mind.

If one were to stagger some of the activities involved during consecutive interpretation, it would be safe to assume that 1) listening, 2) note-taking and 3) the actual consecutive delivery itself that is the rehearsal involved when reconstructing the original message by way of notes, are three successive activities that deserve closer examination in terms of human information processing.

In an attempt to determine how much each of the three above-mentioned tasks contributes to the processing of information in terms of the depth-of-processing hypothesis ( Craik and Lockhart, 1972), Experiment III was devised in order to examine, in detail, each individual task. Furthermore, the aim of this research was to examine the notes taken by the interpreters since these may provide necessary information on the nature of the notes themselves, about their relationship to the original material and, hopefully, about the nature of the cognitive processes involved.

Individuals normally take notes with either or both of two aims in mind. First, notes provide a means of reproducing and storing knowledge for later consultation. Secondly, notes may contribute in a relatively distinct manner to the individual's

acquisition of personal knowledge, in other words, his learning (Howe, 1975).

Literature justifying note-taking also tends to fall into two broad categories. The first one deals with the notes themselves, perceiving them as an external storage mechanism (Miller, Galanter and Pribram, 1960), and the second, deals with the note-taking process, viewing it as an encoding mechanism that facilitates retention, and considering the notes per se as simple by-products of the above-mentioned process (Aiken, Thomas and Shennum, 1975; Di Vesta and Gray, 1972). Both internal and external mechanisms will be examined in this chapter.

First, a theoretical framework endorsing the hypothesis that note-taking facilitates retention will be outlined. Second, the opposing view stating that the note-taking process inhibits retention will be presented, followed by evidence supporting both theoretical positions. Finally, a detailed examination of the notes themselves will be included.

In order to consider note-taking as facilitating the encoding process, one must recognize in note-taking certain cognitive activities through which material is stored in long-term memory. When taking notes, the interpreter is engaged in a series of behaviours which potentially aid his retention: he constructs mnemonics, covertly and overtly rehearses the material presented to him. Note-taking can facilitate learning by causing the interpreter to process the incoming information, that is, interpret, infer, condense, paraphrase, as well as provide him with an external memory storage for use in later study. The first among the above-mentioned activities is rehearsal. Rehearsal, which includes the representation and the repetition of an item to oneself, may serve two functions: it may maintain the item in short-term memory or it may transfer the item into long-term memory ( Craik, 1973 ), or it may do both. Further, according to Craik and Watkins (1973),

the maintenance function of rehearsal is certainly necessary but not sufficient for long-term retention: in order for transfer of an item into long-term memory to take place, it must be elaborated and associated with material already present in long-term memory. So, in order for note-taking to facilitate retention, it must not only involve mere repetition and maintenance; it must also involve some form of elaboration or further processing. This organizational process which results from a transaction between short-term memory and longer term storage through which superordinate units are formed from collections of input items is known as 'chunking' (Miller, 1963).

In addition to this elaboration, the item must be given time to 'gel' in order for it to be stored in long-term memory. Hebb referred to this amount of time as a consolidation period during which:

"... newly acquired learning must be undisturbed for some time if it is to last... and must be allowed to mature... between 15 minutes and an hour or thereabouts."

(Hebb, 1966) p. 122-123

Thus, if note-taking is to be regarded as facilitating retention, the material must be allowed to set. If the act of note-taking is unable to provide a consolidation period, allowing the material to set, at least it should not preclude one.

Let us begin by examining the theories which hold that note-taking involves the following cognitive processes - rehearsal, elaboration and consolidation, among others - all of which facilitate retention. Aiken, Thomas and Shennum (1975) claim that the act of transcribing notes in itself is an act of rehearsal: the motor act of writing, with its mental processes, serves to maintain and revivify the material (Garner, in press; Weener, 1972) suggests that when taking notes, students are transforming the

lecture material in associational, conceptual or inferential ways. According to Weener, all note-taking is, to a certain extent, a process of elaboration. Even if notes are a verbatim reproduction of the incoming information, Weener hypothesizes that the material is being elaborated through associative linking with other material in long-term memory. If the notes conceptually or inferentially represent, i.e., paraphrase or summarize, the material in the structure, then chunking or coding according to categories available in long-term memory has occurred. In other words, the note-taker is considered, to a certain degree, as actively processing the material.

The second possibility is that taking notes can help an individual attend to the material he is trying to learn (Estes, 1970; Howe, 1975).

Another suggested outcome of note-taking is that the particular version of the original material that an individual has thus prepared, constitutes one which by virtue of the coding operations that have gone into its preparation is especially meaningful and understandable to that person (Howe, 1975). It is thus more useful to him than an alternative version would be, such as the summary prepared by the lecturer. Research on the role of organization in long-term memory demonstrated both that performance is considerably influenced by the manner in which each individual organizes the items to be remembered and that the effect of repeated presentation of word lists may be negligible if the way in which materials are organized in successive presentations cuts across the organizational patterns that the learner has previously imposed (Bower, 1970). Further evidence is provided by research in the Bartlett tradition, which claims that when individuals learn from prose passages, they retain versions of the passages as processed and interpreted by themselves.

Another way in which note-taking might reasonably be expect-

ted to influence performance is through activities that occur at the time of note-taking or the coding and processing operations which each person undertakes as he deals with the information presented to him, making a direct contribution to learning. One of Howe's investigations was to discover whether systematic relationships exist between learning and the kinds of individual differences which are apparent when one examines students' notes.

"It is worth asking whether the contents of an individual's notes are related to his performance in a subsequent test designed to measure learning of the passage, in circumstances whereby the notes each subject takes are removed from him upon completion... Among the measures scored were, a) the total number of words appearing in subjects' notes, and b) the number of meaningful segments (out of a total of 20) that were considered by judges to be accurately reproduced in the notes. Dividing b by a gives us an indication of the extent to which each learner was successful in recording a large amount of meaningful content in a small number of words, and we might reasonably regard this index as forming a measure of the 'efficiency' of note-taking".

(Howe, 1975) p. 160

Di Vesta and Gray (1972) view note-taking as a transformational process which...

"... reflects a transaction between the learner and the material to be learned; that is, it assumes or suggests an active learner. In a sense, the learner has taken the initiative necessary to put the material into long-term storage; thoroughly encoding, the learner has linked the material to his existing cognitive structure - he has made it meaningful".

(Di Vesta and Gray, 1972) p.8

It has also been pointed out that note-taking facilitates retention by providing consolidation periods for rehearsal and coding (Howe, 1970; Weener, 1972). Di Vesta and Gray (1973) suggest that note-taking provides consolidation periods in the following ways: first, the lecturer pauses after important points to allow students to take notes. This pause allows the material to 'gel' in addition to permitting the student to perceive the most natural chunks into which the material can be organized. Second, notes focus attention away from extraneous material, letting the main points mature. Di Vesta and Gray point out, however, that the best consolidation period may be immediately after the lecture, a period not normally provided for in the standard classroom procedure where note-taking occurs concurrently with listening and is followed by some totally different activity.

In order to view note-taking as interfering with retention, note-taking must include certain activities that prevent materials from being stored in long-term memory. The notion that note-taking interferes with learning is largely based on the premise that an individual cannot perform two activities at the same time - in this case, transcribing notes on the one hand and attending to the lecture, on the other. More specifically, theoretical arguments against note-taking as a storage mechanism focus on the limited capacity of short-term memory. Conceptualized as a rehearsal buffer (Atkinson and Shiffrin, 1968), short-term memory attends to and rehearses a select number of stimuli. Those stimuli not in short-term memory are not encoded into long-term memory, or, at least, are not processed as deeply (Treisman, 1969). Thus, the act of note-taking prevents the student from attending to all the materials in the lecture. In such extreme cases, note-taking which is used solely for the purpose of external storage can only be incompatible with efficient learning. Such notes tend to be taken in a

mechanical fashion and tend to interfere with attention with a possibility of engendering the feeling that the task has been accomplished for the time being at least. The kind of note-taking which serves a role in encoding should be much more efficient than one used solely for external storage purposes.

Berliner (1971) has theorized that there is an interaction between short-term capacity and the value note-taking has for an individual. The greater the short-term memory capacity, the less note-taking interferes with retention.

"A psychological analysis of note-taking leads to the hypothesis that only when memory aptitude is high does one possess the ability to accurately store orally transmitted information for the time necessary to transcribe it accurately. Likewise, only at such aptitude levels can one store and attend to the new information that is being transmitted while transcribing any previously obtained information. When memory aptitude is low, these abilities are not likely to be present, and thus it is as efficient for the learner to pay attention to the lecture".

(Berliner, 1971) p.35

In the same vein, Di Vesta and Gray (1973) point out that the number of ideas presented before the consolidation period may overload the capacity of short-term memory. Thus, much of the material would not be retained long enough to be rehearsed and organized.

Other arguments against the facilitating effects of note-taking assume that the act of note-taking involves a low level of cognitive elaboration. Weener (1972) hypothesizes that verbatim note-taking interferes with higher level transformational processes, but not with lower level processes such as those measured by a recognition test. Di Vesta and Gray (1972) point out that having notes may serve as a substitute for engaging in transformational activities. This would certainly be the case if the



student's purpose in rehearsal were to maintain the material only until he had transcribed it, with the intention of studying the material at a later date. Such a process would lack the elaborative activities necessary to transfer materials into long-term memory.

The theoretical arguments indicating that note-taking interferes with attending to the lecture are persuasive, but they assume that transcription requires attention and that attention is unitary. Research on automatization indicates that transcribing one's notes may not require attention. Perhaps the earliest study exploring this possibility was conducted by Leon Solomons and Gertrude Stein (1896). They reported that they were able to read short-stories or novels and transcribe dictated materials at the same time. At later stages of practice, they found that the writing became unconscious or automatic. Spelke, Hirst and Neisser (1976) obtained similar results. They found that not only could subjects read and transcribe unrelated material at the same time, but that the transcribed material was processed inferentially. When given a recognition test on the transcribed material, subjects were most likely to recognize sentences that were not actually presented but could be inferred from those that were presented. Their results, they felt, yielded two alternative conclusions. Either attention could be divided, or complex cognitive activities could be automatized. The fact that they preferred the former alternative and their reasons for this preference are not germane to this discussion. However, the implications of their results are relevant insofar as either alternative, divided attention or automatization, provides a viable explanation of how one could take notes and pay attention to a lecture at the same time.

Another possibility supporting the notion that listening and note-taking are compatible rather than conflicting tasks is the multiplexing notion (i.e. serial processing with rapid switching between two or more channels) or parallel processing as a form of serial

processing (Lachman, Lachman and Butterfield, 1979). Parallel processing involves true simultaneity without loss of information. Certain components of biological and communication systems are capable of parallel processing. That is, two messages can be transmitted simultaneously over a single channel without loss of information and without multiplexing.

#### Experimental Results on Note-Taking:

According to Hartley and Marshall (1974), there are three reasons why one takes notes:

1) Students believe that their notes will be useful for revision at a later date: they provide a record of what was 'covered': the fact that absent students later borrow from another student's notes gives testimony to this ;

2) Students believe that the note-taking process itself - that is, writing things down in their own words - will somehow help their subsequent recall;

3) Perhaps, more prosaically, students consider that note-taking helps keep them awake and aids their concentration during lectures.

When one attempts to determine whether the process of note-taking aids recall or not, most investigations attempting to answer this question have come up with conflicting answers. Much of the empirical research on note-taking has attempted to determine whether or not note-taking improved retention. Out of nine studies only three which compared the test performance of students taking notes with students prevented from doing so have found that note-taking yielded higher test scores. These three investigations were those of Crawford (1925a) and Crawford (1925b) and Di Vesta and Gray (1972).

In the early studies, Crawford (1925a) found that the median correlation between the number of ideas from the lecture recorded

in the notes and scores on a recall quiz was  $r = .5$ . That is, the more ideas in the notes, the better the students' performance on the quiz. Crawford also calculated the probability that an item would be correct on the quiz depending on whether or not that item was recorded in the student's notes. Crawford concluded that:

"Taking notes on a point does not guarantee it being recalled at the time of the quiz, but failing to take note of it very greatly decreases its chances of being recalled".

(Crawford, 1925a)p.289

He also reported that the relationship between the number of ideas in the notes and recall was moderated by whether or not the quiz was delayed, i.e. by whether or not students were able to use notes as an external storage device. When the quiz was given immediately, the relationship between number of ideas in the notes and recall was weaker than when students had an opportunity to review their notes. Nonetheless, Crawford (1925b) reported that notes are effective as an encoding mechanism:

"A careful analysis of all the facts seems to justify the conclusion that the immediate value of notes is less than the delayed-review value. This immediate value is of sufficient importance, however, to justify the practice of taking notes, even if there is no opportunity to use them later".

(Crawford, 1925b) p. 384

It should be noted here, however, that Crawford did not explore the possibility that both the number of ideas in the notes and scores on the quizzes were both a function of the extent to which the student attended to the lecture. Thus, he may only have found that better students take more notes and do better on quizzes, not that they do better on quizzes because of the

value of the notes as an encoding mechanism.

In the same vein, other researchers have found note-taking to have a beneficial effect on subsequent retention. Howe (1970), for example, found that ideas from the lecture recorded in the notes were more likely to be recalled than ideas not in the notes when testing subjects one week after the lecture. When each individual's notes were compared with the precise content of his attempt at recall, it was found that, on average, 0.34 of the items recorded in a subject's notes were subsequently recalled, whereas of the meaningful content that did not appear in an individual's notes, only 0.05 of the items were subsequently recalled. In another study, Locke (1977) reported that the more ideas students accurately recorded in their notes, the higher their course grades were.

Still other research however, has found the relationship between note-taking and retention to be more complex. Di Vesta and Gray (1972), for example, compared note-taking with other rehearsal strategies including (1) mental review immediately after the lecture and (2) taking a test on the material immediately after the lecture. They reported that each of the strategies produced better retention than just listening to the lecture. In a later study (1973), they examined the relationship among note-taking, short-term memory span and recall. All students listened to a 30 minute lecture divided into three parts. In between sections of the lecture, note-takers reviewed their notes while those who did not take notes reviewed mentally. They found that those who reviewed their notes did better on a free recall task. Although there were no differences in performance on a true-false test given immediately after the lecture, students who took notes did better on a true-false test given a week later. In addition, they reported that the relationship between recall and whether or not a student took notes was moderated by short-term memory span.

Memory span was positively correlated with performance on the true-false tests (both immediate and delayed) for those who took notes, but not for those who did not. Thus, Berliner's (1971) hypothesis that note-taking interferes with learning for students with a low memory capacity but not for students with a high memory capacity is borne out.

Aiken, Thomas and Shennum (1975) also examined the effects of memory capacity on the extent to which taking notes interferes with retention. But instead of correlating memory capacity with retention, they manipulated the speed and the density of the lecture, the rationale being that increasing speed or density would have the effect of straining memory capacity. They also had three note-taking conditions. Some students took notes during the lecture, some took notes after the lecture, and the rest took no notes whatsoever. They found that the higher the density of the lecture, i.e. the more ideas presented per minute, the less recall. Thus, short-term memory capacity did in fact limit retention. However, it did so equally for all groups, including those subjects who had not taken any notes, indicating that taking notes does not magnify the effects of this limitation. At the same time, interference at the higher levels of lecture was primarily with retention of those ideas not recorded in the notes, indicating that students do, in fact, focus on the material they take notes on to the exclusion of other material. Also, increased density caused subjects to take terser or more efficient notes. That is, subjects expressed their ideas in fewer words when given less time. This would indicate that subjects are able to adjust their note-taking style according to the constraints imposed by time. This ability to adjust may enable them to attend to the lecture and take notes, if not at the same time, with efficiently rapid alternation.

They also found that taking notes immediately after the lecture produced the best recall and recognition, while those subjects

taking notes during the lecture and those not taking notes performed in approximately the same manner. However, this may only indicate the benefit of providing a consolidation period rather than the greater effectiveness of taking notes after the lecture. After the lecture, the other groups engaged in an unrelated activity. When Eisner and Rohde (1959) compared the same note-taking strategies without providing an unrelated activity after the lecture for the other groups, they found no differences in scores on a true-false test. In fact, Eisner and Rohde were unable to find any measurable differences between the immediate or delayed true/false type test performances (after an interval of three weeks) of students who had made notes for fifteen minutes compared with students who had made no notes during the lecture, but made notes in the fifteen-minute period immediately following it.

MacManaway (1968) failed to find any significant differences between the fill-in type test scores of students in a no-note condition compared with those of students who took notes normally when a test was given without warning one week later. Howe (1970a) also failed to find any significant differences between test performances of students using various note-taking strategies when listening to a two-minute prose passage.

Whether the process of note-taking in itself aids subsequent recall, Freyberg (1956) found that on immediate testing, students in the no-notes situation did significantly better on a test comprising mainly multiple-choice questions than did students utilizing various note-taking strategies (no notes; brief notes; full notes; duplicated notes provided for students to follow during the course of the lecture). This superiority of the no-notes condition was maintained on a subsequent re-test given two weeks later, but after a subsequent ten minute review period and a further two-week delay, students receiving the duplicated summary did best of all. Freyberg thus concluded that students permitted to use for

revision purposes the notes they had made while listening to a lecture recalled more of the lecture's content than individuals who were prevented from consulting their notes.

Peters (1972) examined the relationship among note-taking, lecture-speed, a measure of listening efficiency and retention.

Overall, he reported that note-takers did worse on a multiple-choice test administered immediately after the lecture than students not taking notes. However, he found that this effect was moderated by listening efficiency. Low efficiency listeners did better when they did not take notes; high efficiency listeners did as well or better when they took notes. When the input material was speeded up, there were no differences in retention scores between those who took notes and those who did not.

An investigation conducted by Fisher and Harris (1973) set out to examine the effect of note-taking and review on recall. When testing for recall of information processed under several conditions, they found that the best results were provided by the condition in which subjects took their own notes and were given the opportunity to review them. The second best results came following the condition where subjects were not allowed to take notes but instead, were provided with notes furnished by the lecturer. Fisher and Harris concluded that note-taking serves as both an encoding function (where the subject takes his own notes) and as an external memory function (where the subject reviews his notes) with the latter being more important. Furthermore, the authors claim that of the two functions, the one serving as the external memory device provided the greater facilitating effect upon recall. Like Di Vesta and Gray (1973), Fisher and Harris found that subjects reviewing their own notes scored highest on a free recall test. At the same time, those who took no notes and who reviewed the lecturer's notes scored the second highest, higher than those who took notes and reviewed the lecturer's notes.

These results would indicate that taking notes might interfere with retention. At the same time, the replicated finding that reviewing one's own notes yields the most recall suggests an interaction between the function of notes as an external storage device and their function as an encoding mechanism. It may be more beneficial to review one's own notes for two reasons: first, in reviewing one's own notes, one is rehearsing material one has already rehearsed to some extent during the transcription. Therefore, there is more total rehearsal of material which may facilitate recall. Second, when transcribing the material, one has to a certain point encoded it in a form that is more meaningful to the encoder, more meaningful than the original source material. Thus, one is more likely to benefit from reviewing this material because it is more meaningful to him (Di Vesta and Gray, 1972; Garner, in press).

Weener (1972) examined the effects of what kind of test students expect on the amount of notes they take. He reported that there was no difference in the amount of notes whether students expected to take a multiple choice test, an essay test or be asked to give a verbal presentation. He did find however, that when students expected to be tested immediately, they took half as many notes as when they expected to be tested in a week. He concluded that when students expect to be tested immediately, they engage in more cognitive transformational behaviour and less behaviour aimed at external storage. At the same time however, the fact that students took notes at all when they expected to be tested immediately, suggests that they view note-taking, at least in part, as an encoding process.

However, there are at least five other experiments in this area which reported no significant differences between the test performances of students utilizing various note-taking strategies and those of students not taking notes. For example, Jones (1923)



was unable to find any difference between the test performance of students utilizing various note-taking strategies and those of students not taking notes. McClendon (1958) examined the relationship between note-taking style and comprehension. He divided students into four groups according to the type or style of notes they took. These were:

- 1) regular note-takers (on main points and details);
- 2) recorders of main points only;
- 3) recorders of details only;
- 4) those students taking no notes whatsoever.

McClendon found no significant differences in the immediate or delayed comprehension tests, that is on the tests given immediately or five weeks later. However, the fact that those who took no notes did as well as the rest, even on the delayed test, call these results into question (Garner, *in press*).

The other studies which reported no significant differences between subjects taking notes and subjects not taking notes were those of Eisner and Rohde (1959), MacManaway (1968) and Howe (1970a), all mentioned above.

To recapitulate, several studies have found that encoding leads to better recall (Howe, 1970; Di Vesta and Gray, 1972 and 1973) and other studies have found that external storage is the more efficient function (Fisher and Harris, 1973; Hartley and Marshall, 1974; Carter and Van Matre, 1975; Rickards and Friedman, 1978; Howe, 1975). Very few studies indicated that neither function is the more efficient (Fisher and Harris 1974a; Fisher and Harris, 1974b).

In 1974, Tony Buzan introduced a different approach to note-taking called patterning. The main notion when making patterned notes is to identify the central theme in the information being presented to be represented by a key word or phrase located in the middle of the page. From this nucleus, a structure can be

drawn using lines, doodles, arrows, shapes all radiating from the central notion in any direction desired. Only key words and, more rarely, phrases are written, rather than sentences. All the words are written in capital letter and every word must be connected to at least one other word on the page, by a line, arrow or symbol. A small amount of information can be recorded in full linear, verbal form, for example in the case of formulae, quotations. These can either be written in the corners of the page and somehow linked into the pattern by means of a number, symbol or arrow, or, as Buzan himself suggests, note-takers are urged to use two pages during note-taking: one for patterning and the other for longer linear notes.

The rationale behind Buzan's method is that although we may be used to material presented in linear form, both in speech and in print, our brain does not function in a linear fashion (Norton, 1981). But the advantage of patterned notes over linear ones for subsequent recall seems to depend on two factors:

- 1) the use of what Buzan calls "key" words and phrases;
- 2) the active involvement of the note-taker when transforming the source material when taking patterned notes.

Buzan distinguishes between key recall and key creative words. A key recall word is described as 'one which funnels into itself a wide range of special images, and which when it is triggered, funnels back the same images' (p. 75). A key creative word, on the other hand, is more general than the former and is 'especially more evocative but do(es) not bring back a specific image' (p. 76).

"The question of whether the process of taking notes is of itself actually of value for later recall has revolved around the central dilemma of whether students take notes to have a concrete record of the information presented to them or whether they believe that the actual act of taking notes somehow helps in the learning process. It is the latter that

.... continued/

Buzan stresses as important. He argues that by making patterned notes, the student is actively involved in imposing his own organization on the incoming information. Buzan claims that the linear note-taker, on the other hand, is merely acting as a passive recorder of information".

(Norton, 1981) p. 76

### Summary of Experimental Studies:

From the foregoing review of the literature, some generalizations can be made. First, that better students take more notes. This does not mean that note-taking causes them to be better students (Garner, in press). Second, the differences in recall of lecture material between students taking notes and those taking no notes are less clear when subjects are randomly assigned to each note-taking condition. It cannot be concluded at this point that note-taking is superior to other modes of attending to college lectures, especially for all students. Specifically, it cannot even be said that taking notes during a lecture is preferable to taking notes after a lecture, to being tested immediately after class, or to reviewing the lecturer's notes after simply listening to the lecture (Aiken et al., 1975). Third, taking notes does seem to interfere with retention for students with low short-term memory capacity (Peters, 1972; Aiken et al., 1975). However, this interference does not seem to occur with high short-term memory capacity students. Furthermore, no differences between note-takers and students not taking notes were found when the density of lectures was increased. Thus, it cannot be assumed that note-taking necessarily interferes with attention, rehearsal or elaboration. Finally, students seem to study more effectively from their own notes than from other sources of lecture material, indicating an interaction between the function of notes as an external storage device and as an encoding mechanism.

In order to understand precisely what cognitive activities note-takers are engaged in, one must assume that transformation of material is taking place. The mere act of translating the French source language into native language notes, English, is sufficient proof that some kind of transformation is taking place. In order to facilitate the reading of notes and render the consecutive delivery as uninterrupted and as smooth as possible, most interpreters think it is preferable to solve all the translation 'problems' while the notes are being taken. For this reason, most competent interpreters believe that it is best to take notes in the language in which the interpretation will be given (Herbert, 1952). But the question remains as to the nature of these transformations.

Implicit to the notion of note-taking is that of converting a given message into its basic conceptual units or its underlying abstract form. The interpreter must decode the message into its abstract form before undertaking translation, before proceeding to encode the message into the target language. This intermediary step of all translation activity, that of the exegesis, finds extension and elaboration in consecutive interpretation (Garretson, 1982) and is recorded in the consecutive interpreter's notes. The interpreter seems to be able to extract the meaning of the material from its external form, store this information in an abstract form, and, in the course of recognition and recall, reconstruct the stored material anew, imposing on it a new grammatical and syntactic structure.

Most studies have examined the number of lecture ideas in the notes and related that to other variables such as speed of source material or various note-taking approaches (Aiken, Thomas and Shennum, 1975; Di Vesta and Gray, 1972, 1973). A few studies have examined the efficiency of the notes (Howe, 1970). Howe set out to examine certain principles which claim that the

"most important single factor influencing learning is what the learner already knows" (Ausubel, 1968). In order to determine how whatever the learner brings to the situation interacts with the learning material to predict the outcome, Howe undertook to examine the relationship between the coded version and what is subsequently being recalled.

By asking subjects to take notes on meaningful prose material to which they attended, Howe hoped that the notes would give him some indication of how the material was perceived and interpreted by each individual, in other words, examine the relationships between the subject's notes and his subsequent attempts at recall.

As we have previously mentioned, Howe (1970) attempted to measure the efficiency of note-taking by the following ratio:

$$\frac{\text{number of items reproduced in notes}}{\text{number of words in notes}}$$

and meaningful recall.

(Howe, 1970, p. 62)

The correlation was statistically significant,  $r = .53$  ( $p < .05$ ). Howe found that although there was a significant positive correlation between the 'efficiency' of note-taking as defined above, and the success of subsequent recall attempts, it was still conceivable that the activity of note-taking in itself made a contribution to subsequent retention, additional to the encoding effects preceding the note-taking activity.

Howe also found that the very low probability of a meaningful item not appearing in a subject's notes being subsequently recalled correctly suggested that the notes made provided a useful indication of how the materials are processed and encoded.

For Howe, efficiency during note-taking is the number of ideas divided by the number of words. But such variables tell us very little about their relationship to the cognitive material, and, therefore, about the nature of the intervening cognitive processes. This study proposes to formulate specific hypotheses about the nature of these cognitive processes and to explore new ways of analyzing notes so that these hypotheses can be tested.

The present study:

This experiment proposes to study the effects of note-taking on retention among conference interpreters by comparing the results obtained on recall and recognition tests following three conditions:

(1) a listening task where the subject is asked to devote his full attention to the task in that no other concurrent activities are present;

(2) a straight-forward consecutive interpretation condition, a task which is familiar to interpreters working in Europe: subjects are asked to listen to a French prose passage, make notes in English concurrently. Once the prose passage is over, the interpreter delivers, in English, the consecutive interpretation of the original speech with the use of his notes. Following consecutive delivery, the notes are removed from the subject who is then asked to recall as much of the original passage, in English, as possible.

(3) the third condition - the experimental condition - led subjects to believe that another straight-forward consecutive delivery was going to be expected of them, as in Condition 2. This approach was used to ensure that subjects would take notes in the same way as they normally would for any usual consecutive delivery. However, as soon as the listening and note-taking phases were completed, the notes were suddenly and unexpectedly removed from the subjects by the experimenter. They were permitted to tak

notes but were then asked to recall the original speech without the use of their notes, thus by-passing the interpolated rehearsal task of reconstructing a consecutive delivery by way of notes.

The reason for omitting this review or rehearsal was to allow investigation of the possible facilitation of recall due to the act of note-taking alone. Thus, the effect of any encoding processes involved in note-taking would thus be isolated from the effects of external storage mechanism, that is using notes as a rehearsal device for review.

If note-taking interferes with retention (Di Vesta and Gray, 1972), then one would expect Condition 1 (listening without making notes) to yield the highest scores both on recall and recognition tests. If, on the other hand, note-taking enhances learning and retention (Klatsky, 1975), then either condition 2 (consecutive delivery with notes kept) or Condition 3 (where notes are taken but not put to their normal use) would be expected to yield the highest recall and recognition scores.

Condition 2 was expected to provide the subject with the greatest opportunity to strengthen the learning task in that in addition to listening, the subject was asked to take notes, rehearse the entire passage by delivering it in another language with the use of notes before being asked to recall it.

Condition 3, the experimental condition, was designed to measure the amount of learning involved when the notes were not put to their normal use. It was thus hoped to determine the role played by note-taking per se, by comparing recall and recognition scores following Conditions 2 and 3.

Condition 2 was expected to yield the highest recall and recognition scores, significantly higher than either Condition 1 or 3. Condition 1 was hypothesized to yield the second best set of retention scores, followed by Condition 3 with the poorest scores, although no significant differences were expected between the latter.

Subjects:

Subjects were nine trainee-interpreters, all students in their fourth month of training at the Polytechnic of Central London on the Diploma Course in Conference Interpretation Techniques. No subject had interpreted for more than four months and the mother-tongue common to all subjects was English with French as the first passive language. Six of the nine subjects had served in the former experiments.

Experimental Design: (See Appendix Page 321-a)

A 3 X 3 Graeco-Latin Square design was used in a split intentional learning paradigm (for Conditions 1 and 2) and an incidental learning paradigm (for Condition 3, where the notes were suddenly removed from the subject). Each of the nine subjects was asked to 1) listen to, 2) interpret consecutively with the use of his notes and 3) recall without the use of notes, three French prose passages of equal length.

Prior to the experiment, subjects were informed that each condition would be followed by two tests designed to measure the amount of recall and recognition. Both texts and tasks were randomized and counter-balanced across subjects.

Procedure:

Three French passages of approximately 300 words each were selected from "General Studies French" by Light and Howitt, 1966. The passages dealt with the following topics: 1) demographics; 2) the motorway; and 3) the use of cannabis. These texts were taken from the same level of difficulty section in the manual and lent themselves to the construction of questions on their factual content without making any special demands on subjects' knowledge of technical vocabularies. The passages were recorded by a female native - speaker of French at approximately 1.6 words per second.



Each subject heard the stimulus tapes under simulated conference interpretation conditions. The experimental tapes were relayed to the subject through stereophonic headphones coming from one tape-recorder and subjects' recall was recorded simultaneously onto a Sony cassette-recorder for subsequent transcription and evaluation.

Following each condition, subjects were asked to recall, in their mother-tongue, English, as much of the input speech presented to them in source language, French. When subjects could recall no more, the cassette recorder was turned off and three recognition tests were administered in the following order: 1) word or lexical recognition test; 2) content or semantic recognition test; 3) word-order or syntactic recognition test. For those conditions which required consecutive interpretation, the notes were collected either after the consecutive delivery in Condition 2 or immediately following the end of the input speech in Condition 3.

Scoring procedures are provided in detail in Experiment 1. Tables III - 1 and III - 2 are samples of propositional scoring for free recall and consecutive delivery where subjects made use of their notes.

### Results:

Table III - 3 presents the means and standard deviations of free recall scores following three conditions, listening, consecutive interpretation with notes and consecutive with notes removed.

Table III - 4 presents the analysis of variance which was carried out on the results obtained and shows how the the type of task demanded of the subject prior to recall had a significant effect on the eventual score obtained:  $F = 8.11$  ;  $p < .01$  ; d.f. = 2, 12.

Table III - 1

Sample of Propositional Scoring for Free Recall

Source language input in French  
(English translation)

Sample of one subject's recall  
(as given in English)

Propositional Score:	Title: "Demographics"	"The subject was demography"	Propositional Score:	
4	It has taken nearly one million years	The world took a million		3
1	for the population	years...		
3	to reach its first milliard.	... history of human		
2	The milliard was reached	development was that		
2	around 1800	the figure of one milliard		2
2	and the second milliard	people on the globe was		
2	about 130 years later.	only reached after one		
1	The third	million years of human		
3	only required 30 years	history.		
3	and 15 will suffice	The second milliard		2
1	for the fourth.	was reached about 130		2
3	World population increases	years after that		
3	as a result of natural movement	the third		1
2	that is the excess of births	30 years after		2
2	in relation to deaths.	and the fourth is expected		
2	The drop in mortality	to be achieved		
4	first came about in developed countries	only 15 years after that.		3
2	but also manifested itself	This is a natural phenomenon		
1	in a spectacular fashion	because of the growth		
1	in Africa,	in the birth rate		2
1	Asia	and the lowering		2
1	and Latin America	of the death rate.		2
2	during the last 30 years.	This is especially true		1
		in the developed countries.		2

Input score: 49

Recall Score: 26

Input Score: 49  
Output Score: 26  
Percentage: 53%

Table III - 2

Sample of Propositional Scoring for Consecutive Delivery  
(with notes)

Source language input in French  
(English translation)

Sample of one subject's consecutive  
delivery as given in English

Propositional Score	Title: "Demographics"	"Demography"	Propositional Score
4	It has taken nearly one million years	One million years were necessary	
1	for the population	for the world population	
3	to reach its first milliard.	to reach one milliard.	
2	The milliard was reached	This occurred	
2	around 1800	in about 1800.	
2	and the second milliard	The second milliard	
2	about 130 years later.	in world population	
		was reached 130 years later,	
1	The third	and the third... for the third	
3	only required 30 years	only 30 extra years	
3	and 15 years will suffice	were necessary.	
1	for the fourth.	It is expected that the 4th	
		milliard will be reached	
		15 years after that.	
3	World population increases	The population throughout	
		the world	
3	as a result of natural movement	has been increasing through	
		a natural phenomenon	
2	that is the excess of births	that is to say the excess of	
		births	
2	in relation to deaths.	over deaths.	
2	The drop in mortality	The death rate lowered	
4	first came about in developed	in the developed countries	
	countries		
2	but also manifested itself	but a spectacular decline	
1	in a spectacular fashion	in this rate has been noticed	
1	in Africa,	in countries such as	
1	Asia	Latin America,	
1	and Latin America	Africa	
2	during the last 30 years.	and Asia	
		for the last 30 years.	

Input Score:  
49

Recall Score:  
46

Input Score: 49  
Recall Score: 46  
Percentage: 94%

Table III - 3

Means and Standard Deviations  
for the Free Recall Scores

Condition:	LISTENING	CONSECUTIVE DELIVERY WITH NOTES KEPT	CONSECUTIVE NOTES REMOVED
Raw scores:	$\bar{X} = 38.5$ S.D. = 9.92	$\bar{X} = 46.91$ S.D. = 13.95	$\bar{X} = 35.94$ S.D. = 11.64
Percentage Score:	47.33%	58.66%	46.33%

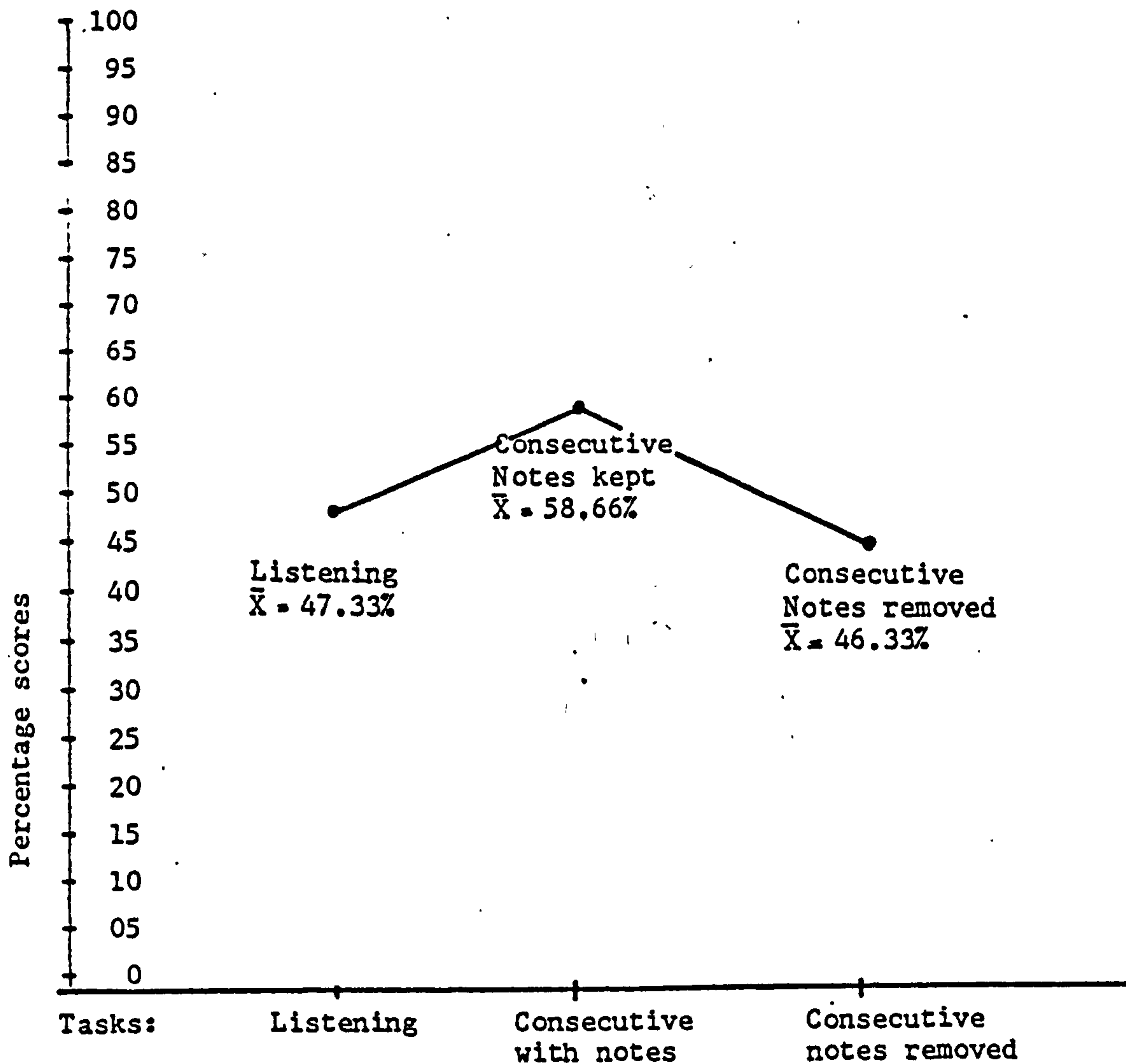


Figure III - 1  
Scores Obtained on the Free Recall Measure  
According to Task

Table III - 4

Analysis of Variance for the Free Recall Scores

Source of variation	SS	df	MS	F
<u>Between S's</u>	<u>3804.67</u>	<u>8</u>	<u>475.58</u>	
Groups	941.56	2	485.78	1.02 n.s.
S's within groups	2863.11	6	477.19	
<u>Within S's</u>	<u>1852.00</u>	<u>18</u>	<u>102.89</u>	
A order	121.56	2	60.78	1.11 n.s.
B text	190.89	2	95.44	1.75 n.s.
C task	884.67	2	442.33	8.11** p ≤ .01
residual	0	0		
error within	654.89	12	54.57	
total	5656.67	26		

In order to determine which particular task influenced the subsequent score obtained on recall protocols, Scheffé tests of multiple comparison (Guilford, 1973; p.243) were performed on the means. Results showed that scores obtained following the consecutive with notes kept condition (Condition 2) were significantly higher ( $\bar{X} = 58.67\%$ ) than both the consecutive notes removed (Condition 3) ( $\bar{X} = 46.33\%$ ) ( $F = 6.28$  ;  $p \leq .05$ ) and listening (Condition 1) ( $\bar{X} = 47.33\%$ )( $F = 5.30$ ;  $p \leq .05$ ). In other words, recall scores following the condition where rehearsal with the use of notes was permitted were significantly higher than as a result of listening. More important, they were also higher than the condition which had allowed for notes to be taken, but where the latter had not been put to their proper use.

#### Recognition tests:

Recognition scores will be presented both in terms of the mean scores obtained on all three types of recognition tests, followed by the results obtained on each individual test, namely lexical, semantic and word-order recognition tests.

Table III - 5 presents a summary of the mean recognition scores obtained on the three types of recognition tests as a result of the three experimental conditions, namely 1) listening, 2) consecutive interpretation with the use of consecutive notes and 3) consecutive interpretation without the use of notes.

An analysis of variance was carried out on the mean scores obtained following all three types of recognition tests. Results indicate that the nature of the task required of the subject prior to recall influenced the subsequent score obtained beyond the .01 level ( $F = 7.57$  ;  $p \leq .01$ ; d.f. = 2, 12). Two other main effects were significant in addition to the task effect, namely text ( $F = 21.86$  ;  $p \leq .001$ ; d.f. = 2, 12), and group ( $F = 8.54$  ;  $p \leq .05$ ; d.f. = 2, 12). Results of the analysis of variance are presented in Table III- 6.

Table III - 5

Means and Standard Deviations  
of Mean Recognition Scores

Task:	LISTENING	CONSECUTIVE NOTES KEPT	CONSECUTIVE NOTES REMOVED
$\bar{X}$ =	63.85%	74.44%	66.59%
S.D. =	14.08	15.08	16.68



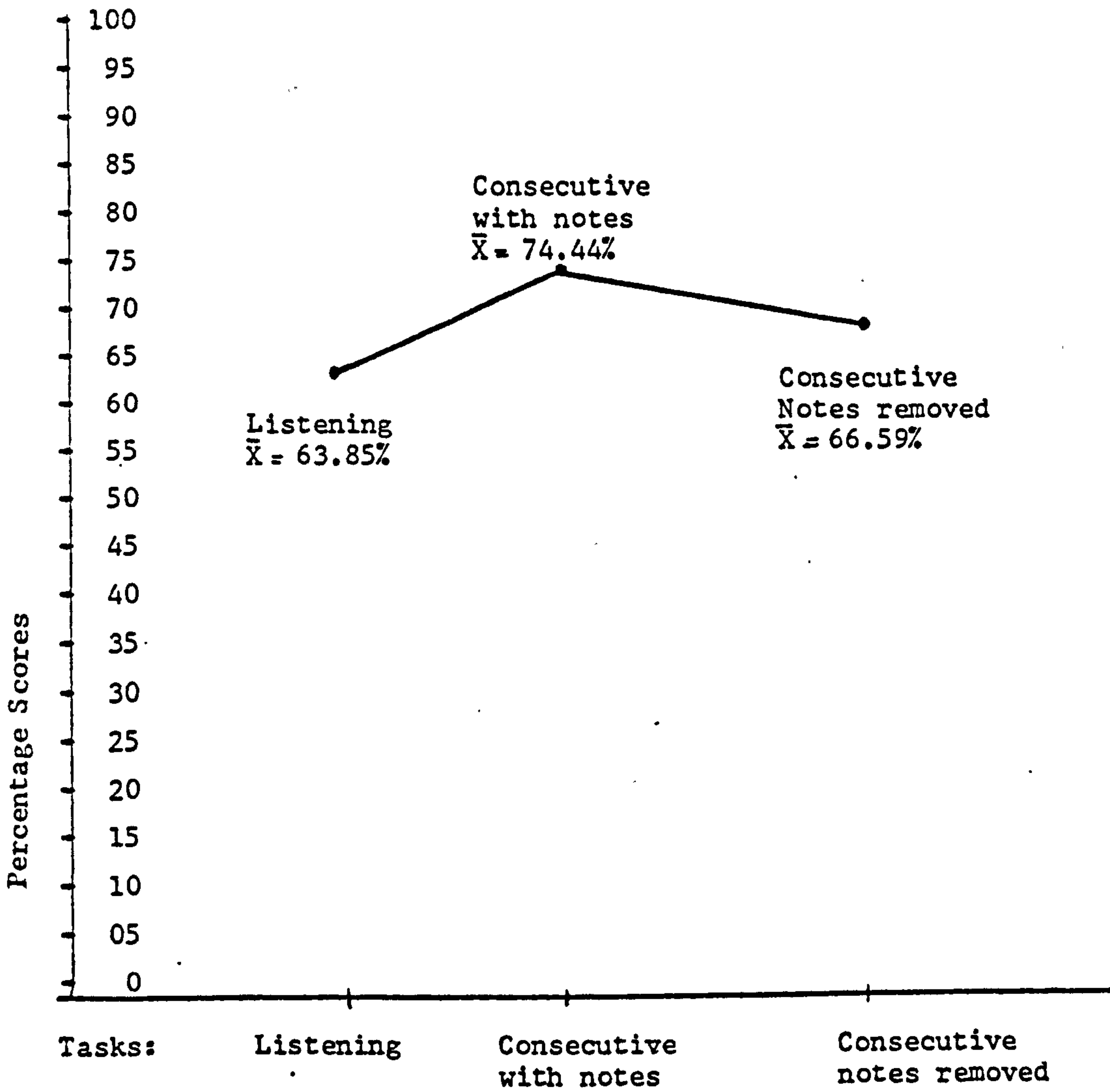


Figure III - 2

Mean Scores Obtained on the Three  
Recognition Tests

Table III - 6

Analysis of Variance

Mean Score on all Three Recognition Tests

Source of variation	SS	df	MS	F
<u>Between S's</u>	<u>245.79</u>	<u>8</u>	<u>30.72</u>	
Groups	181.88	2	90.94	8.54* p < .05
S's within groups	63.91	6	10.65	
<u>Within S's</u>	<u>2620.65</u>	<u>18</u>	<u>145.59</u>	
A order	75.37	2	37.69	1.05 n.s.
B text	1570.23	2	785.11	21.86*** p < .001
C task	544.01	2	272.01	7.57** p < .01
residual	0	0		
error within	430.96	12	35.91	
total	2866.35	26		

In order to determine which particular task influenced the subsequent scores obtained on the recognition measures, Scheffé tests of multiple comparisons were carried out on the means. Results indicated that the scores obtained as a result of the consecutive interpretation condition with notes kept ( $\bar{X} = 74.44\%$ ) were significantly higher than those following consecutive interpretation with notes removed ( $\bar{X} = 66.59\%$ ), ( $F = 3.86$  ;  $p \leq .05$ ;  $d, f. = 2, 12$ ). Although the mean scores obtained following the consecutive with notes condition ( $\bar{X} = 74.44\%$ ) were somewhat higher than those obtained following listening ( $\bar{X} = 63.85\%$ ), this difference was not significant.

Type of recognition test:

By examining the mean of all the scores obtained after each recognition test, irrespective of the task preceeding the test, no significant differences were obtained between any of the means. In other words, the mean scores subsequent to the lexical recognition tests ( $\bar{X} = 68.59\%$ ) were not significantly different from those following the semantic recognition tests ( $\bar{X} = 67.04\%$ ) or the word-order recognition tests ( $\bar{X} = 69.26\%$ ). The means and standard deviations of the scores are presented in Table III - 7 and in Figure III - 3.

Lexical Recognition Test:

If we now examine each type of recognition test individually and in the order in which they were administered to subjects, Table III - 8 presents a summary of the results obtained on the lexical recognition tests following each condition.

An analysis of variance was carried out on the results obtained following the lexical recognition test. Scores did not vary to any significant degree as a result of the nature of the task required of the subject prior to taking the lexical recognition test. The main effects are presented in Table III - 9.

Table III - 7

Means and Standard Deviations

According to the Type of Recognition Test

LEXICAL RECOGNITION TEST	SEMANTIC RECOGNITION TEST	SYNTACTIC RECOGNITION TEST
$\bar{X} = 68.59\%$	$\bar{X} = 67.04\%$	$\bar{X} = 69.26\%$
S.D. = 10.96	S.D. = 19.18	S.D. = 16.26

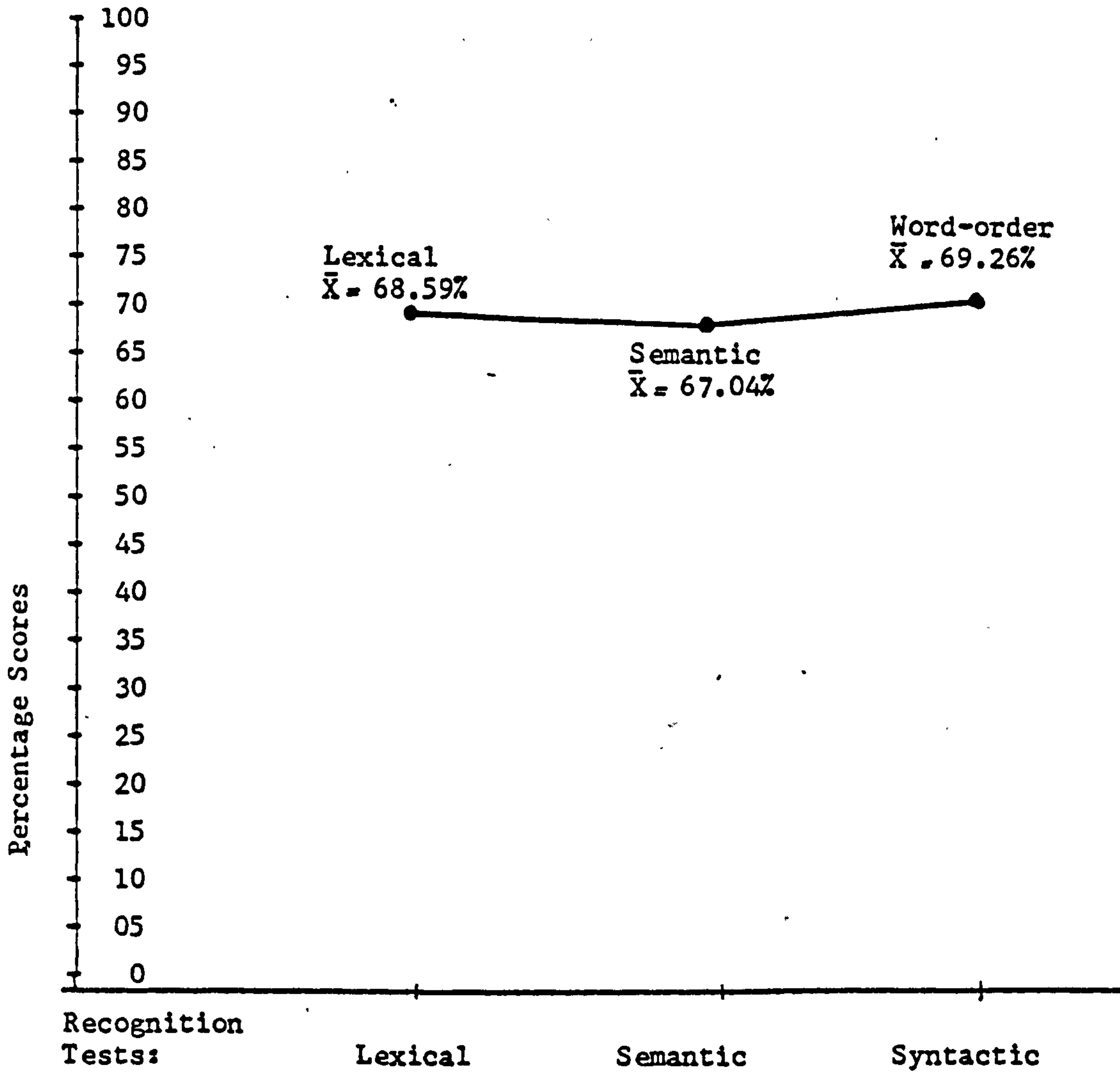


Figure III - 3

Mean Scores Obtained According  
to Type of Recognition Test

Table III - 8

Scores Obtained on the Lexical  
Recognition Test

Recognition Measure:

LEXICAL

Tasks:

	LISTENING	CONSECUTIVE WITH NOTES	CONSECUTIVE NOTES REMOVED
$\bar{X}$ =	63.78%	72.22%	69.78%
S.D. =	13.82	8.70	9.01

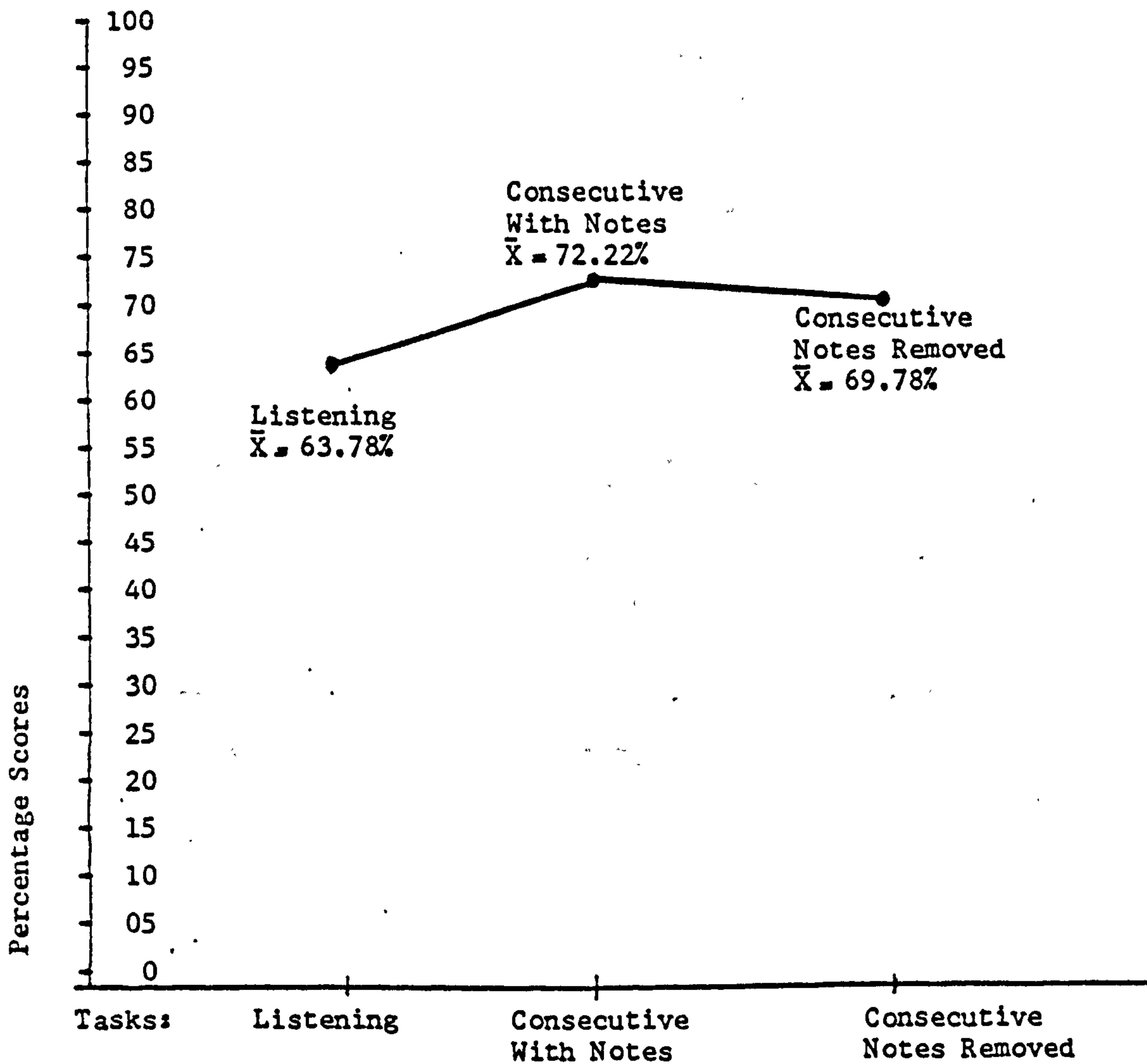


Figure III - 4  
Mean Scores Obtained on the  
Lexical Recognition Test

Table III - 9

Analysis of Variance  
for Lexical Recognition Test

Source of variation	SS	df	MS	F	
<u>Between S's</u>	<u>979.85</u>	<u>8</u>	122.48		
Groups	84.96	2	42.28	.28	n.s.
S's within groups	894.89	6	149.15		
<u>Within S's</u>	<u>2142.67</u>	<u>18</u>	119.04		
A order	263.41	2	131.70	1.56	n.s.
B test	498.29	2	249.15	2.87	n.s.
C task	339.85	2	169.93	1.96	n.s.
residual	0	0			
error within	1041.11	12	86.76		
total	3122.52				



Table III - 10

Scores Obtained on the Semantic  
Recognition Test

Recognition Measure:

LEXICAL

Tasks:

	LISTENING	CONSECUTIVE WITH NOTES	CONSECUTIVE NOTES REMOVED
$\bar{X} =$	63.78%	72.22%	69.78%
S.D. =	13.82	8.70	9.01

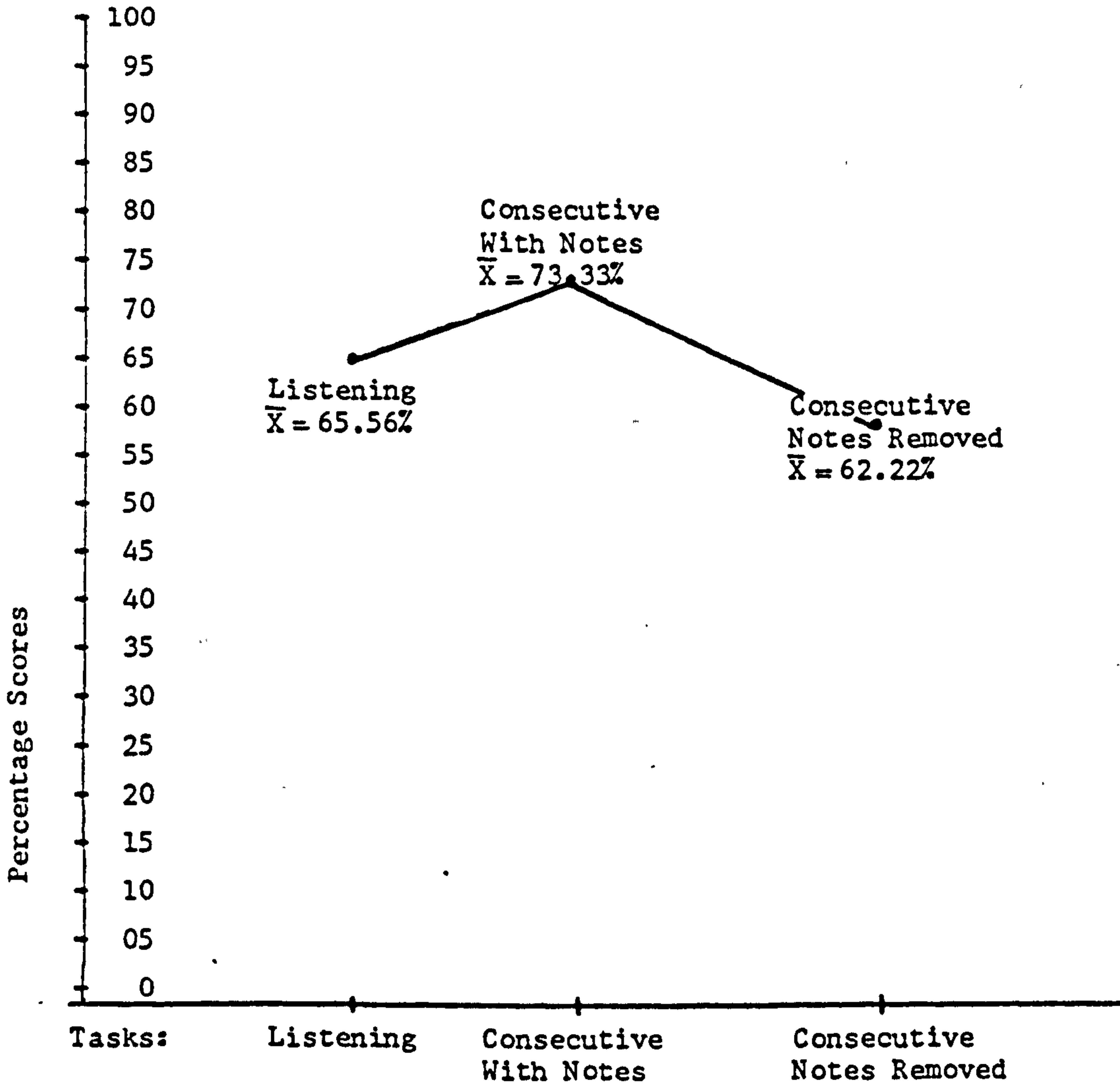


Figure III - 5

Mean Scores Obtained on the  
Semantic Recognition Test

Table III - 11

Analysis of Variance  
on the Semantic Recognition Scores

Source of variation	SS	df	MS	F
<u>Between S's</u>	<u>1829.63</u>	<u>8</u>	288.70	
Groups	540.74	2	270.37	1.26 n.s.
S's within groups	1288.89	6	214.81	
<u>Within S's</u>	<u>7733.33</u>	<u>18</u>	429.63	
A order	29.63	2	14.81	.14 n.s.
B text	5874.07	2	2937.04	28.32*** p < .001
C task	585.19	2	292.59	2.82 n.s.
residual	0	0		
error within	1244.44	12	103.70	
total	9562.96			

Semantic recognition scores:

Table III - 10 presents a summary of the results obtained on the semantic recognition scores according to the task required of the subject beforehand.

An analysis of variance was performed on the results and showed that the nature of the task required of the subjects did not influence the scores obtained on the subsequent recognition test to any significant degree ( $F = 2.82$ , n.s.) The significant main effect was that of the nature of the text involved ( $F = 28.32$ ;  $p \leq .001$ ; d.f. = 2, 12) in that one of the texts consistently subjects greater difficulty in terms of recognition. Subsequent analysis revealed that the text entitled Demographics yielded significantly higher semantic recognition scores than the other two texts. But since the texts and the order in which subjects had been asked to process them was systematically varied across subjects and conditions, the text effect was not considered a major factor (See Table III - 11).

Word-order recognition test:

Table III - 12 presents a summary of the results obtained on the word-order recognition test according to the task required of subjects prior to taking the word-order recognition test.

An analysis of variance was performed on the results and showed that the nature of the task required of the subjects did not influence the scores obtained on subsequent recognition tests to any significant degree ( $F = 3.60$ ; n.s.) The significant main effect was that of the nature of the text involved ( $F = 4.67$ ;  $p \leq .05$ ; d.f. = 2, 12) in that Demographics yielded significantly higher word-order recognition scores than the other two texts. Table III - 13 presents the analysis of variance for the word-order recognition test scores.

Table III - 12

Means and Standard Deviations of Scores  
Obtained on the Word Order Recognition Test

Recognition measure:

WORD-ORDER

Tasks:

	LISTENING	CONSECUTIVE WITH NOTES	CONSECUTIVE NOTES REMOVED
$\bar{X} =$	62.22%	77.78%	67.78%
S.D. =	13.94	16.41	16.68

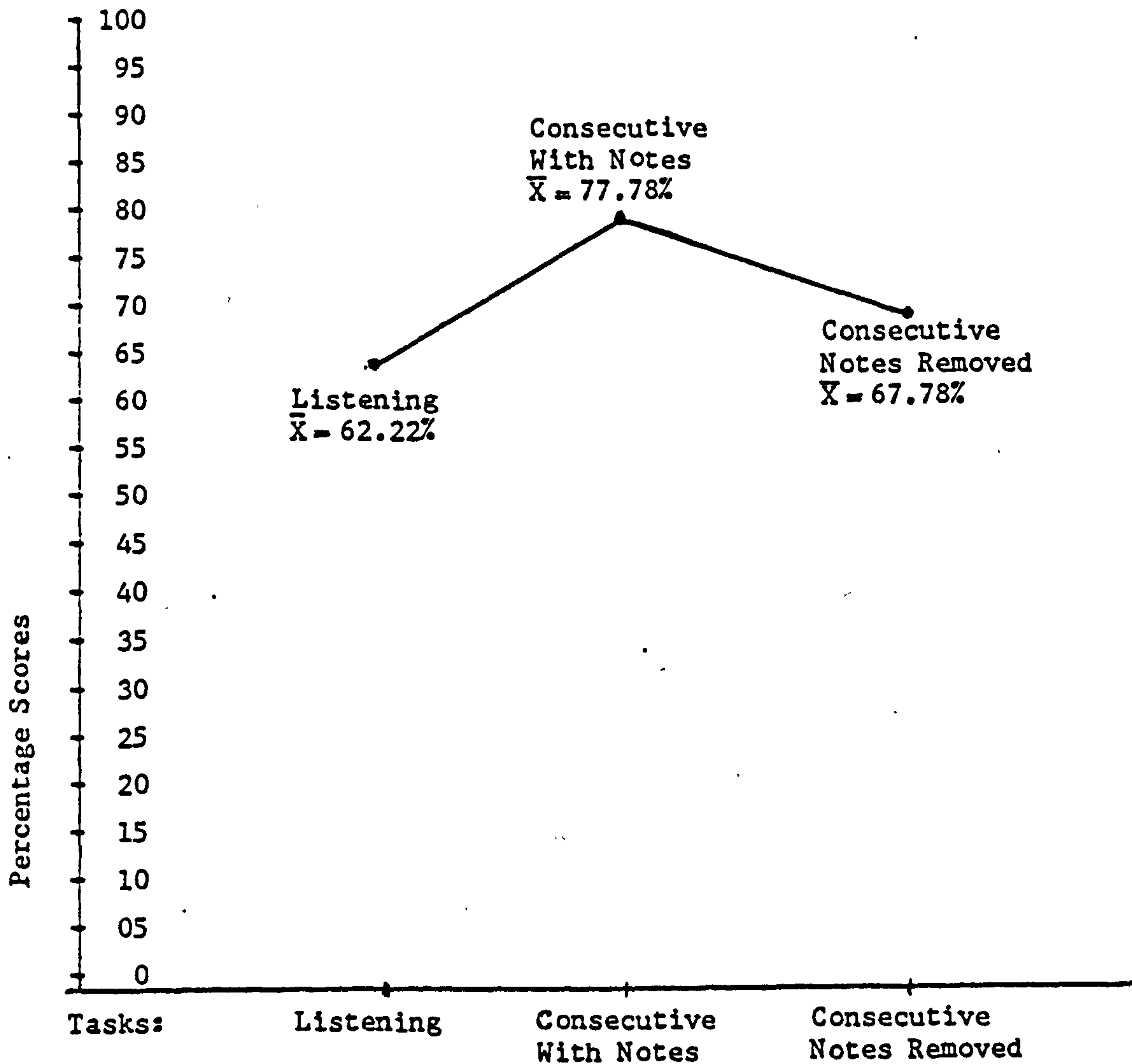


Figure III - 6  
Scores Obtained on the Word-Order  
Recognition Test

Table III - 13

Analysis of Variance  
on the Word-Order Recognition Test

Source of variation	SS	df	MS	F
<u>Between S's</u>	<u>2651.85</u>	<u>8</u>	331.48	
Groups	185.19	2	92.59	.23 n.s.
S's within groups	2466.67	6	411.11	
<u>Within S's</u>	<u>4533.33</u>	<u>18</u>	251.85	
A order	96.30	2	48.15	.31 n.s.
B text	1451.85	2	725.93	4.67* p<.05
C task	1118.52	2	559.26	3.60
residual	0			
error (within)	1866.67	12	155.56	
total	7185.19	26		

Discussion:

Recall and recognition will be examined separately.

Recall:

In order to test the effects of note-taking per se, the review period was eliminated. The purpose of eliminating the review period would be to permit the investigation of the possible facilitation of recall due only to the act of note-taking. Thus the effects of any encoding processes involved during note-taking would be isolated from the effects of external storage mechanisms (i.e. using notes as a source for review).

One main prediction of this investigation was clearly confirmed in that the rehearsal provided by consecutive delivery where subjects were allowed to keep their notes during the reconstruction of the passage produced learning that was superior to both a no-note condition (where subjects simply listened) and note-taking on a purely external level (where the notes were suddenly removed from the subject).

Note-taking and the subsequent rehearsal function as learning aids which facilitate encoding. When coupled with notes, the rehearsal provided by consecutive delivery represents a useful strategy for affecting subsequent recall. Note-taking alone proved to be of questionable value, contrary to Crawford's (1925) that:

"A careful analysis of all the facts seems to justify the conclusion that the immediate value of notes is less than the delayed-review value. The immediate value is of sufficient importance, however, to justify the practice of taking notes, even if there is no opportunity to use them later". (p. 384)

The act of taking notes may indeed improve delayed recall when a review period (or a rehearsal interference period) is included. Notes do not appear to improve immediate recall when they serve only as external storage mechanisms and where subjects are prevented from rehearsing the material.

An unexpected finding was that there was no significant difference found between note-taking and the no-notes condition.



Howe (1974) proposed four possible consequences which could result from note-taking:

- the provision of a permanent record of the lecture material;
- increased attention to the lecture material;
- the encoding of the material into a more personally understandable and retainable form;
- and greater retention due to the encoding process itself.

The critical factor seems to be the rehearsal factor between the note-taking activity and the onset of recall. If this rehearsal period is eliminated, then it would appear that listening (no notes) provides the subject with as deep a form of processing as note-taking but on a purely external level. In other words, if one knows that no rehearsal will be allowed following a processing task, one might as well listen and attend to the message rather than risk attention sharing activities such as note-taking which involve both listening and writing, especially since these notes cannot be put to their proper use.

The results obtained in this experiment support the external storage notion that note-taking per se does not facilitate recall unless learners are given the opportunity to review their notes prior to recall. The external storage idea thus suggests two possible functions for notes:

- 1) a rehearsal function whereby enhanced recall is only due to recall of material from the notes just reviewed.
- 2) a reconstruction function suggesting that the recall of notes allows learners to reconstruct parts of the passage on which no notes were previously taken.

The question of whether the note-taking process is of itself of value for later recall has revolved around the question as to whether students take notes to have a concrete record of the information presented to them or whether they believe that the act of taking notes somehow helps in the learning process.

The present investigation supports Di Vesta and Gray's (1972) hypothesis that the encoding function is more important than external storage in aiding the learning process.

The most opportune time for consolidation may be a period immediately following a lecture during which time the student can review and contemplate the content of the material presented to him.

Recognition:

When all three recognition tests were considered as a unit, consecutive delivery with notes kept for rehearsal ( $\bar{X} = 74.44\%$ ) yielded significantly higher scores than either consecutive delivery with notes removed ( $\bar{X} = 66.59\%$ ) and listening ( $\bar{X} = 63.85\%$ ). When neither group rehearses the input (listening condition and notes removed condition), simultaneous note-taking is either equal to or poorer than the no-note condition, a finding which supports the results of Aiken, Thoman and Shennun (1975).

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CHAPTER V

CONSECUTIVE NOTE-TAKING

Interpreters' notes differ from those taken by students during a lecture. In the case of a consecutive interpreter, the notes will be put to use almost immediately, once the speaker has either paused or ended his speech while the content of the speech is still fresh in the interpreter's mind. Students taking notes during a lecture, on the other hand, will refer to their notes hours, days, perhaps even weeks later.

Broadly speaking, the object of note-taking is to supplement memory efficiently. Notes are essentially individual in character: some note-takers seem to want to record everything presented to them; others want to pick and choose the relevant items. Still others take little or no notes at all.

Most interpreters take running notes as the speech is being delivered, not even waiting for an idea or a sentence to have been expressed in its entirety. Ideally, the interpreter should proceed to a logical analysis of the speech as it is being delivered and take his notes accordingly (Herbert, 1952).

Note-taking appears to have more beneficial results than negative ones (Aiken et al., 1975), but there still remains the need to examine what cognitive activities the note-taker is actually engaged in, and the need to demonstrate the existence (if any) of the relationship between differences in the notes taken by individuals and differences in learning. If note-taking does have an important encoding function, then it ought to be possible to find a relationship between differences in the notes taken and differences in learning (Howe and Godfrey, 1977). By examining the attributes of the notes made by an individual (such as number of items recorded, percentage of symbols used, accuracy of notes) would form a framework for making predictions about a note-taker's performance in a subsequent recall test.

A number of researchers have undertaken investigations that involve examining and searching for relationships between individuals' notes and their performance on tests assessing learning. Howe (1970) for example, observed that items which appeared in an individual's notes were around six times as likely to be recalled in a subsequent test as items from the passage presented to the subjects that did not appear in that individual's notes.

In the same experiment, Howe obtained a measure of how 'good' an individual's notes were. The measure took the form of the ratio obtained by dividing the number of meaningful items correctly recorded in the person's notes (the measure of accuracy) by the actual number of words in the notes. The assumption was that the greater the amount of encoding, the better the student would be able to provide a version of the material "in his own words", departing from the original form and containing a smaller number of words. In short, the ratio obtained was an indication of the student's ability to reproduce the content with a high degree of accuracy but a small number of words.

The next step was to discover whether this index of the 'goodness' or 'efficiency' of notes was related in any way to learning, as measured by performance on a free-recall test. In fact, there was a statistically significant positive correlation,  $r = + .53$ , so it does appear that what the authors termed as an 'efficient' note-taking strategy was indeed an effective one (Howe and Godfrey, 1977).

Relationships between what is learned and the content of notes are also provided by an early empirical study on note-taking undertaken by Crawford (1925) who found a positive correlation ( $r = + .5$ ) between the total number of lecture points that were correctly reproduced in the notes and the number of correct points in recall tests. Crawford also found that items omitted or erroneously recorded in notes were very unlikely to be recalled correctly, only 14% of them being scored correct on the test, whereas, on average, 51% of those items which were correctly recorded in the notes were also recalled by the same individual.

Following Howe's hypothesis (1970) that an efficient note-taking strategy is one in which the maximum number of units is communicated in the minimum number of words and where the correlation was calculated between meaningful recall and the following ratio:

$$\frac{\text{number of items reproduced in the notes,}}{\text{number of words in notes}}$$

results in the present investigation showed that:

- 1) the mean number of possible segment items (to use Howe's expression or chunk, meaningful unit or propositional phrase) in the source input was  $\bar{X} = 90.33$ ;
- 2) the mean number of segment items reproduced in the subjects' notes was  $\bar{X} = 66.94$  (S.D. = 8.33) out of  $\bar{X} = 90.33$  or 74% of the input and the average number of items appearing in both the input and the notes was  $\bar{X} = 80.44$  or 89%;
- 3) the mean number of segment items which appeared in the subjects' consecutive delivery was  $\bar{X} = 77.42$  (S.D. = 6.39) or 85% and the average number of items appearing both in the notes and during consecutive interpretation was  $\bar{X} = 74.79$  or 83%;
- 4) the mean number of items recalled once the notes were removed was  $\bar{X} = 46.92$  (S.D. = 13.95) or 52.22%;
- 5) the average number of items to appear in both the notes and consecutive delivery attempts was  $\bar{X} = 74.79$  (S.D. = 15.73) or 83%. The mean number reproduced in neither was  $\bar{X} = 4.22$  (S.D. = 3.56). Thus, the mean probability that a subject would deliver consecutively an item that appeared in his or her notes was .97, whereas the probability of delivering an item that was not present in the notes was .23;
- 6) the average number of items that appeared in both consecutive delivery attempts and recall was  $\bar{X} = 46.91$  (S.D. = 13.95) or 52% and the mean number that was reproduced in neither was  $\bar{X} = 5.78$ .

Thus the mean probability that a subject would recall an item which appeared in his consecutive delivery was .60, whereas the probability of recalling an item that was not present in the notes was .1;

7) the average number of items that appeared in both input and consecutive delivery was 84.00 (S.D.=8.08) or 93%;

8) the average number of items that appeared in both input and recall was  $\bar{X}=49.44$  (S.D.=14.48) or 55%;

9) the average number of items that appeared in both the notes and recall attempts was  $\bar{X}=54.44$  (S.D.=19.86) or 60.33% and the mean number that was reproduced in neither was  $\bar{X}=6.67$  (S.D.=4.18) or 7.44%. Thus the mean probability that a subject would recall an item that appeared in his or her notes was .81, whereas the probability of recalling an item that was not present was .12.

The mean number of words appearing in the notes taken by the subjects was  $\bar{X}=174.11$  (S.D.=18.99). The mean number of words used in recall attempts was  $\bar{X}=316.00$  (S.D.=74.39). There was a significant correlation between the number of words in recall and the number of meaning units recalled:

$$r = .83$$

A closer examination was carried out and a correlation was found between the percentage of written notes and the percentage of items subsequently delivered in the subject's consecutive task:

$$r = .80$$

Crawford (1925a) found that the median correlation between the number of ideas from the lecture recorded in the notes and the score on a recall quiz was

$$r = .5$$

In other words, the more ideas in the notes, the better the students did on quizzes.

No such correlation was found in the present experiment. On the contrary, the mean correlation between the number of items

<u>Subjects</u>	Input	Notes	Consecutive	Recall
A	91	62.75	74.50	35
B	91	74.25	84	68.75
C	91	72.50	82.50	52.75
D	86	57	73	66
E	86	57	68.5	40.75
F	86	60	71.25	51.25
G	94	81	86.50	37.50
H	94	70	74.50	27.50
I	94	68	82	42.75

Table IV - 1

Mean number of meaningful segment units processed by subjects according to task

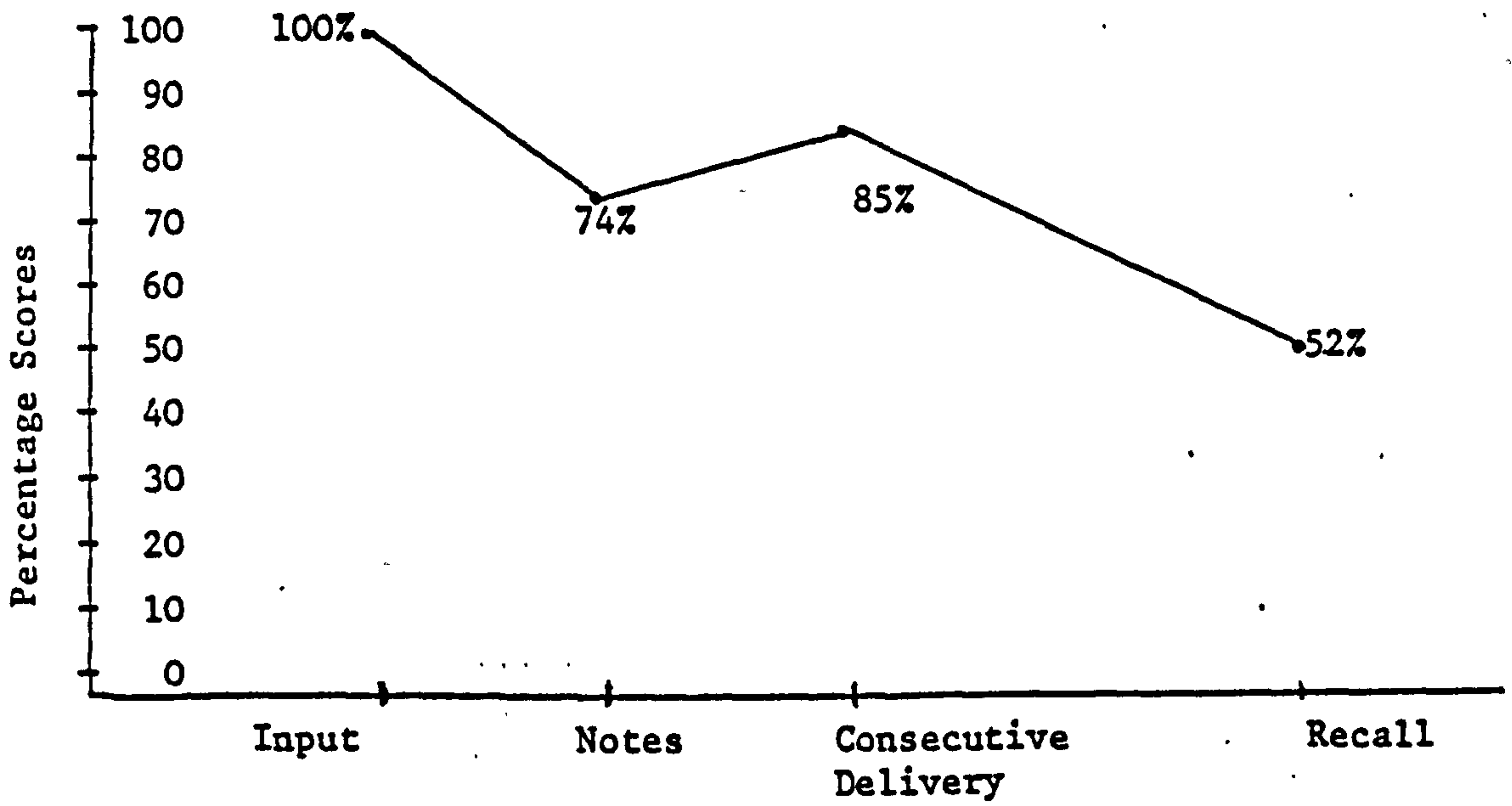
INPUT	NOTES	CONSECUTIVE DELIVERY	RECALL
$\bar{X} = 90$	66.94	77.42	46.92
S.D.=	8.33	6.39	13.95
$Z = 100$	74 %	85.67%	52.22%

Table IV - 2

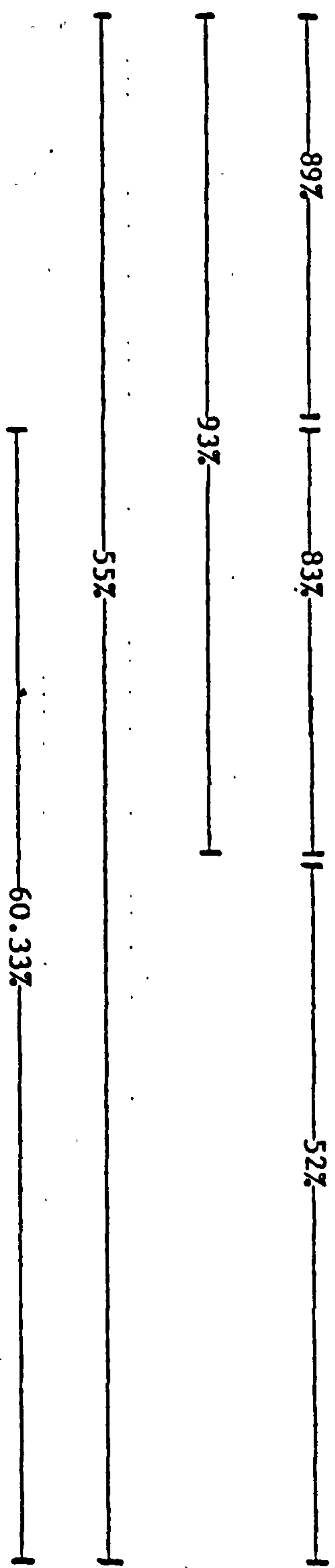
Mean Number of Meaningful Units  
According to Task



Figure IV - 1  
Mean Number of Meaningful Segments According to Task



INPUT NOTES CONSECUTIVE  
 (L1)... $\bar{X}$ =80.44 (89%)... (L2)...  $\bar{X}$ =74.79 (83%).. DELIVERY (L2)...  $\bar{X}$ =46.91 (52%) ... RECALL (L2)



Items appearing both in	Means	Percentages
Input and Notes	80.44	89%
Notes and Consecutive	74.79	83%
Consecutive and Recall	46.91	52%
Input and Consecutive	84.00	93%
Input and Recall	49.44	55%
Notes and Recall	54.44	60%

Table IV - 3  
 Means and Percentages of Meaningful Segment Units  
 and Their Appearance Depending on Task: Note-Taking; Consecutive  
 Delivery and Recall.

represented in the subjects' notes and the subsequent recall scores was:

$$r = -.12$$

On the hypothesis that an 'efficient' note-taking strategy was one in which the maximum number of units was communicated in the minimum number of words, the correlation was calculated between the following ratio:

$$\frac{\text{number of items reproduced in notes}}{\text{number of words in notes}}$$

and meaningful recall (Howe, 1970). Where Howe had found a significant correlation ( $r = + .53$ ;  $p \leq .05$ ), no such correlation was found in the present experiment:

$$r = .10$$

Even when symbols were removed from the number of words in the notes, still no correlation was found:

$$r = .17$$

Even when words written out in their entirety were removed from the number of words in the notes,

$$r = .11$$

And even when symbols alone were correlated with recall units, there was no correlation:

$$r = .18$$

However, from the results obtained in the present experiment, certain conclusions were drawn:

. 89% of the items or ideas presented to the subjects appeared in some form or other in their consecutive notes. This meant words written out in their entire form, abbreviations, symbols, monograms, etc.

. Furthermore, 82.5% of the ideas recorded in the notes reappeared in the oral consecutive delivery, once again, in some form or other, be it correct, partial or erroneous. Further analyses will follow regarding errors and omissions.

Subjects	Number of items in notes	Number of words in notes	Words without symbols	Symbols Only	Entire Words	Meaningful Recall
A	62.75	187	169	18	110	35
B	74.25	177	127	50	60	68.75
C	72.50	153	136	17	119	52.75
D	57	164	138	26	91	66
E	57	151	90	61	72	40.75
F	60	193	159	34	68	51.25
G	81	207	165	42	83	37.50
H	70	181	158	23	68	27.50
I	68	163	140	23	106	42.75

Table IV - 4  
Break-down of Content of  
Subjects' Consecutive Notes

From the above information, it appears likely that the information presented to the consecutive interpreter will be represented both in the notes (89%) and especially during the consecutive delivery (93%). This is no surprise since interpreters are trained and expected to give as complete a version as possible.

If we pursue the argument one step further and examine the recall scores or the ability of these subjects to recall material following consecutive delivery, something which is normally not expected of an interpreter in a real-life situation, in other words something they are not trained to do, results implicate that performance is markedly worse in this condition.

. only 51.5% of the items reproduced during consecutive delivery reappeared during recall;

. only 60.33% of the items appearing in the notes were ever recalled;

. only 55% of any material presented to the interpreter-subject was recalled following the interpolated consecutive delivery.

Such variables tell us very little about the nature of the notes themselves and about their relationship to the original material, and, therefore, about the nature of the intervening processes. What is incumbent upon research now is to formulate specific hypotheses about the nature of these cognitive processes and to explore new ways of analyzing notes so that these hypotheses can be tested.

Notes will therefore be examined as an external storage mechanism which includes a physical description of the notes themselves.

The note-taking process will also be investigated, seen as an encoding mechanism which facilitates retention and which considers the notes as by-products of this process.

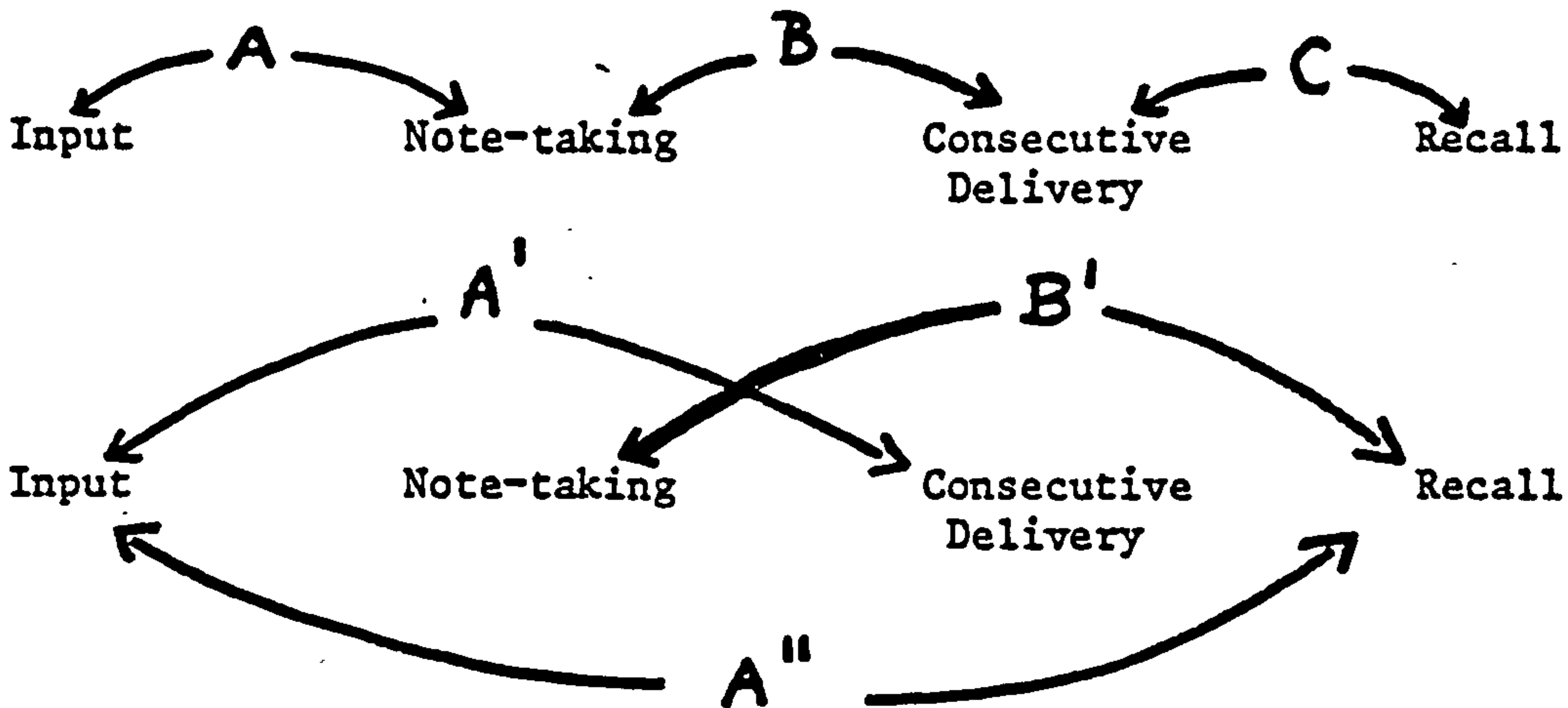
Finally, in order to determine the actual phases of the note-

taking process and to establish where loss of information occurs, additional analyses will be carried out between the following phases:

(Beneath are the tasks required of the subjects and their chronological order:)

- 1) Input            2) Note-taking            3) Consecutive Delivery            4) Recall

- Step A: what happens between Input and the Note-taking phase;  
Step B: what happens between Note-taking and Consecutive delivery;  
Step C: what happens between Consecutive delivery and Recall;  
Step A': what happens between Input and Consecutive delivery;  
Step A'': what happens between Input and Recall;  
Step B': what happens between Note-taking and Recall;



CONSECUTIVE DELIVERY

A physical description:

The first point about a consecutive interpreter's notes is that they should be easy to read and therefore as visual as possible. The interpreter cannot afford to hesitate when trying to decipher them. Interpreters' notes are highly individual in that they would probably mean nothing to another interpreter. However, certain characteristics do appear:

Basing ourselves on the three texts used as input material in this experiment, the mean number of words presented to the subjects in French was  $\bar{X} = 423$ .

The mean number of words written out in their entirety in the consecutive notes was  $\bar{X} = 86.33$  (S.D. 21.27) or 49%. These words included:

- . prepositions (in, on, etc.);
- . nouns (health, men, marijuana, etc.);
- . adjectives (legal, real, chronic, etc);
- . verbs (depend; read; collect; detect, etc.);
- . adverbs (before, etc.);
- . pronouns (he, she, it, etc.);

provided these words were written out in their entire form.

Since the mean number of actual words (entire and abbreviated, symbols and digits) which appeared in subjects' notes was  $\bar{X} = 175.11$  (S.D. 18.89), the percentage of words written out in their entirety was 49%.

The mean number of words written in an abbreviated form was  $\bar{X} = 49.22$  (S.D. = 22.97) or 28% of the total number of words present in the notes.

Abbreviations included the commonly used forms such as "etc." for "et cetera", "&" for "and", "intern'l" for "international" as well as any type of abbreviation devised by the subject either on the spur of the moment such as "alc" for "alcohol" or "mj" for marijuana, as well as abbreviations often used by interpreters in general, such as "pre" for "before" or "D" for "Germany".

One considerable advantage of most symbols is the fact that they do not belong to any particular language and thus eliminate the translation factor when written down in one form and then read out in another.

The mean number of symbols used was  $\bar{X} = 30.33$  (S.D. = 17.53) or 16%;

the mean number of digits used was 11.78 (S.D. = 8.07) or 7%;

Symbols:

As was the case for signs and abbreviations, symbols also do not belong to any particular language and can, without any effort, be written in one language and read out in another, as is the case with numerals (Herbert, 1952).

Symbols can be derived from the alphabet ( $\Sigma$  for economic). Phonetic symbols are of great use for prefixes, endings and even postpositions which frequently recur, such as: con-, -tion, -ment, -able. If for -tion, we choose  $\alpha$  and want to specify a postposition, it can be written as  $\pi$  (which is the Greek letter for 'p': I propose, he proposed, we shall propose, proposal, proposition, propositions, etc) and  $\alpha$ . Proposition becomes  $\pi\alpha$ .


Symbols also include monograms which are made up for a specific purpose, usually a useful and rapid purpose. For example, by combining an A and a G into a  $\mathcal{A}$ , a new sign has just been created which can mean either General Assembly or Agenda. Similarly, the three letters "att" with the "tt" crossed twice to indicate repetition ( $\text{att}^{\text{tt}}$ ) is a useful symbol denoting "to draw attention" or "to attract the attention of...".

Symbols may also comprise punctuation marks. For example, when a sentence or an idea is in the interrogative form, it will be easier for an interpreter to anticipate such a form during his consecutive delivery provided he has prefaced his notes with an upside down question mark, as is the case with the Spanish interrogative symbol:  $\text{¿}$


: will easily indicate the relation between the propounder of an opinion and the opinion itself.


The word 'point' which is so frequently used in most languages in such phrases as : a point on the agenda; on this point; a difficult point; the following point; etc., may be simply represented by a dot. . which may be underlined to avoid any confusion with a full stop .. The "point of view" (or opinion, or




view held, etc.,) may be represented by the small dot above or below what may look like an eye: 


Mathematical symbols are frequently used because they fulfil conditions of brevity, legibility and precision. The most common ones are: +, -, ±, >, <, ≫, ≪, =, ∃, //, ≠, √.

Possibly the most popular symbol is the arrow. It is a highly valuable symbol which may be used for all ideas in connection with sending to, submitting to, exporting to, transmitting to, leading to, arriving in, communicating to, etc. 

When folded back, like so , it may mean to come back from or to bring back from.

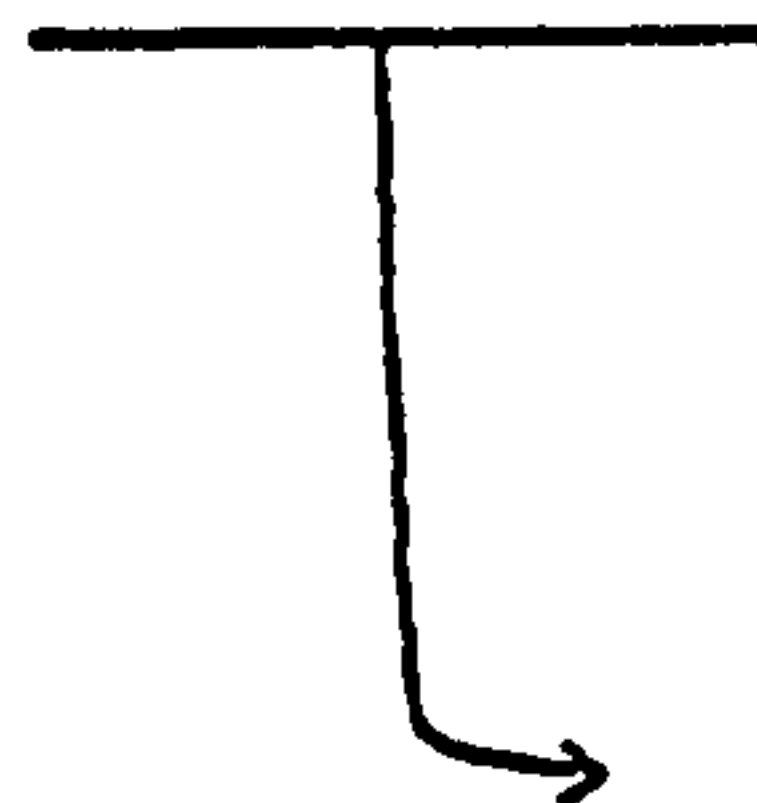
When simply turned back , it means to receive from, to import from, to come from, to leave from, to take out of, etc.

When pointed upwards, , it may mean to increase or to develop.

When pointed downwards, , it may mean to diminish, to restrict, to cut down, to lower, etc.

In practically every case, one's memory will have no difficulty in finding the exact shade of meaning which the arrow was intended for.

When a long and difficult name or phrase comes up unexpectedly in the course of a speech, the interpreters who had no symbol prepared must sometimes write it out in full. But if the same word or phrase were to reappear on the same page, the interpreter need only underline the name written out in full and draw a line from it leading to where it should reappear again. Such reference lines are used very frequently.



Emphasis and negation are two factors which are often translated into symbols. Negation is often transcribed as a line drawn across the word, or as a large X drawn over the word itself to indicate "not" or "absence of". For example, if one wanted to indicate that "Switzerland does not import cotton", one would write the word "cotton" and then cross it out, thus:

"CH ← / cotton"  
or "~~CH~~ ← cotton"  
or "CH ← cot~~ton~~"

The last two examples will stress that Switzerland has not been among the cotton importing countries, or that in the whole of Swiss imports, there was no cotton.

For emphatic negation, two strokes may be used. For instance, "We very strongly object to the suggestion that a vote may be taken" may be simply taken down in note form as "~~vote~~".

Similarly, emphasis may be easily noted by underlining whatever is emphasized and doubly underlining may mean that it was a superlative. For example: "Great pressure was exercised" or "The strongest pressure was brought to bear" may be written as pressure. Conversely, attenuation may be shown by underlining with a dotted line. For instance, "I was somewhat surprised" can be rewritten as "surprise".

In the present experiment, one of the three input texts was chosen for purposes of analysis along with the consecutive notes of six subjects. The types of symbols collected from this sample will be presented alphabetically, in glossary form. 1) arrows; 2) brackets; 3) emphasis; 4) genitive; 5) graphic; 6) lists; 7) mathematical; 8) negation; 9) shorthand; 10) standard symbols and 11) tense.

In addition, a special section is reserved for symbols used in lieu of verbs and copula verbs.

ARROWS

Word-for-word English Translation.

Notes

French input

Possible explanation

Dans les pays dotés d'auto-  
routes, une nouvelle civili-  
sation est en train de naître.  
Civilisation des loisirs et  
aussi de travail.

In countries blessed with  
motorways, a new civilisation  
is emerging. Civilisation of  
leisure and also of labour.

In □s/m w  
new (civn) → )  
leisure  
+ t

The long arrow is used to recall  
the item "civilisation" mentioned  
in the first clause and too lengthy  
to be rewritten.  
The smaller arrow in a horizon-  
tal position is used as a verb.

En Europe, l'autoroute  
est née du chômage.

In Europe, the motorway was  
born out of unemployment.

in W  
m'way ↗ -t

The arrow is used as a verb of  
motion and is pointed upwards to  
denote direction of the movement.

L'Allemagne avait prévu  
le fantastique essor de  
l'automobile.

Germany had foreseen the  
incredible emergence of the  
automobile.

D Δ ↗ car

Here, the arrow is used as a noun  
meaning boom, emergence or a rise.

Dès 1924, à la sortie de  
Berlin, le gouvernement allemand  
mettait en chantier la première  
route à circulation rapide pour  
donner du pain à tous les sans-  
travail de l'après-guerre.

As early as 1924, at the  
Berlin exit, the German  
government undertook the  
first motorway in order to  
feed the post-war unemployed.

24 →  
ex Berlin  
Ger Govt  
est  
1st fast rd  
- bread  
→ uney  
after war

This arrow is used as an adverb  
denoting time.

The second arrow is used as a  
preposition to replace 'to'.

En même temps, les ingénieurs  
mettaient au point les plans du  
grand axe Hambourg-Bâle.

At the same time, engineers  
were finalizing the plans for  
the large axis between Hamburg  
and Basel.

ing° ↗ plans

Here is an example where the subject  
thought that the arrow would be  
sufficient to elicit the idea of  
finalizing but in the consecutive  
delivery, the verb 'developped' was

Brackets

Word-for-word

English translation

French:input

Notes

Possible explanation

... éloignement de tous ... removal of all obstacles,  
les obstacles en particu- especially lampposts.  
lier des lampadaires.

X<sup>1</sup> / obstacles  
(lamps)

The French input paused in such a way that the subject interpreted the item either as an example to be put in brackets, or something to be emphasized. No subject emphasized this item (n = 6)

... peuvent sans perdre ... can, without losing a  
une seconde, vivre comfor- second, live comfortably  
tablement sans quitter without leaving the motorway.  
l'autoroute.

✓ (sans sec)  
live conf.  
sans auto

The syntax presupposes that the clause should be set apart either by a dash or by brackets.

... éloignement de tous . . . removal of all  
les obstacles, en particulier obstacles, especially  
les lampadaires. lamp posts.

no obstacles -  
(esp. lampposts)

Another example, as shown above, where lampposts seemed to belong in brackets, since it served as an example of a type of obstacle.

On s'attache maintenant à More efforts are being made  
supprimer les lignes droites in order to do away with  
pour éviter la monotonie straight lines to avoid the  
des longs parcours... monotony of long distances...

now - trying  
suppress white  
lines  
(monoton)

The subject mistook straight lines for white lines. Monotony may have been put in brackets to indicate that it had something to do with the white lines.

Emphasis

Word-for-word  
English translation

Possible explanation

Notes

French input

En pleine crise At a time of grave economic crisis.. in Σ crise  
économique ...

Emphasis is created by underlining  
the Σ for economy twice.  
The word crisis could have been  
underlined as well.

Ainsi, jour après jour,  
l'autoroute devient de  
plus en plus rapide, de plus  
en plus sûre et de moins en  
moins fatigante.

So, day after day,  
the motorway is becoming  
more and more rapid,  
more and more safe,  
less and less tiring.

• mo dy > dy  
>> rapid  
>> sûr  
<< tiring

The mathematical symbols > and <  
were recorded twice to render the  
emphasis created by the adverbial  
forms 'more and more' and 'less  
and less'.

En pleine crise économique,  
l'Allemagne avait prévu le  
fantastique essor de l'auto-  
mobile.

At a time of grave economic  
crisis, Germany had foreseen  
the incredible emergence of  
the automobile.

in econ cris

The arrow pointing upwards repre-  
sents the idea of boom or emergence,  
of the automobile, which is doubly  
emphasized by underscoring it twice

D forsaw ↑ car  
————

Il les poussa énergiquement  
à la fois pour des raisons  
de prestige et pour des motifs  
stratégiques.

He pushed them energetically  
both for reasons of prestige  
and also for strategic reasons.

↑ ↑ — strag

This is an example where the arrow  
pointing upwards indicated the  
notion of pushing or promoting.  
But the double arrow indicates  
that this action was done energetica-  
lly.

Genitive

French input

Word-for-word English translation

Notes

Possible explanation

... une nouvelle civilisation est en train de naître. Civilisation des loisirs et aussi du travail.

... a new civilization is being born. Civilization of leisure and also of labour.

new civil<sup>n</sup> ↑  
leisure  
wk

The partitive or genitive 'de' in French, or 'of' in English, is often represented as a fraction.

En Europe, l'autoroute est née du chômage.

In Europe, the motorway came about as a result of unemployment.

In Eu  
M / ↑ unemp.

Again, the 'du' in French is kept in the English notes to indicate that the motorway came as a result of unemployment.

... pour donner du pain à tous les sans-travail de l'après-guerre.

... in order to feed all the post-war starvers.

so bread -  
unemp / p War.

The fraction indicates the positive link between the unemployed and the war.

... éloignement de tous les obstacles

... removal of all obstacles

X<sup>1</sup> / obstacles

Partitive or genitive 'de' in French becomes a fraction in English

Dans les pays dotés d'autoroutes...

In countries blessed with motorways...

in O s / mw

The partitive 'd' in French becomes a fraction in the notes.





... sans avoir au retour la punition de devoir faire des queues interminables.

... without having to face the punishment of endless queues on the way back.

sans punir / endless queues

The French 'de' is transcribed as a fraction in the notes.

## Graphic Symbols

<u>French input</u>	<u>Word-for-word English translation</u>	<u>Notes</u>	<u>Possible explanation</u>
Sans risquer leur vie à chaque carrefour...	Without risking their lives at every crossroads...	no danger X roads	An example of a graphic symbol: a cross to depict crossroads. The symbol is used universally,
... glissières de sécurité pour empêcher les voitures de sortir de la chaussée.	... guard rails to prevent cars from going off the road.	glissiere securit to stop 	The arrow is used here to represent the movement of a car going off the road.
l'Allemagne avait prévu le fantastique essor de l'automobile.	Germany had foreseen the incredible emergence of the automobile.	D  car	The eye is drawn to indicate any notion of vision, prediction, or any verb meaning 'to see'.
... pour que les conducteurs ne soient pas éblouis par les phares des voitures arrivant en face.	... so that drivers are not dazzled by the lights of oncoming traffic.	so not blinded 	This is by no means a common symbol. It was created on the spur of the moment and reappeared in both consecutive delivery and during recall.
... et l'on fait des plantations d'arbustes sur le terre-plein central.	... and shrubs are planted in the central reservation	trees ' 	In consecutive delivery, the subject said: "Trees are being planted in the centre". In recall, "... and they are now planting trees in the central reservations".
On s'attache maintenant à supprimer les lignes droites pour éviter la monotonie des longs parcours.	More efforts are made in eliminating straight lines in order to avoid the monotony of long journeys.	Now _____ out stop monot.	The graphic symbol used here is a simple straight line in order to depict exactly what the French meaning intended: a straight line.

Mathematical Symbols

<u>French input</u>	<u>Word-for-word English translation</u>	<u>Notes</u>	<u>Possible explanation</u>
Il les poussa énergiquement à la fois pour des raisons de prestige et pour des motifs stratégiques.	He pushed them energetically for reasons of prestige and also for strategic reasons.	- pushed •• prestige + strategy	Mathematical symbol used in geometry to denote cause in the relation 'because... therefore'
La voiture y est reine	The automobile is king	Car = R	The equal sign (=) is often used to replace a copula verb.
... l'autoroute devient de plus en plus rapide de plus en plus sûre de moins en moins fatigante.	... day after day, the motorway is becoming more and more rapid, more and more safe, less and less tiring.	• dy > dy mo >> rapid ↑ >> sûr ↓ << tiring	The symbol '>' meaning after; '>' meaning thus or therefore; '>' meaning more; '<' meaning less; both used twice for emphasis. ' > ' < ' ;
Dans les pays dotés d'autoroutes...	In countries blessed with motorways...	In D + ✓ M	The symbol '+ ' is used here to indicate the presence of something as opposed to its absence.
... les ingénieurs ont introduit d'importantes modifications de détail	... engineers have introduced important changes of detail.	ing ↑ det. ∞	The symbol '∞' is used here to depict a change or a modification.
... pour donner du pain à tous les sans travail de l'après-guerre.	... to feed all the unemployed after the war.	bread -t° > war	The symbol 'o' as in degree, is used here to represent a human trait. Unemployment would be '-t°'; Unemployed people becomes: '-to°';



Negation

French input      Word-for-word English translation      Notes      Possible explanation

... points noirs supprimés      ... black spots eliminated      pts ~~noirs~~      The subject first made a note of the item to be eliminated and then made a cross over the adjective.

... éloignement de tous les obstacles.      .... all obstacles moved as far away as possible      X<sup>1</sup> / obstacles      In this instance, the negation symbol 'X' preceded the item to be removed.

On s'attache maintenant à supprimer les lignes droites.      Efforts are made to eliminate straight lines.      now X st. line      In this example, the negative symbol 'X' was used to replace a verb.

Points noirs supprimés      black spots eliminated      X bl spots      The negation symbol precedes the item to be eliminated.

... éloignement de tous les obstacles      ... all obstacles moved as far away as possible      X obstacles near      The negation symbols precedes the item to be eliminated.

... pour que les conducteurs ne soient pas éblouis par les phares des voitures arrivant en face.      ... so that drivers are not dazzled by the headlights of oncoming traffic.      so driver = X dazzled.      The symbol for negation preceded the verb.

... peuvent vivre confortablement sans quitter l'autoroute.      may live comfortably without leaving the motorway      live comfortably X lve Ms      The symbol for negation precedes the verb 'to leave'.

Shorthand

<u>French input</u>	<u>Word-for-word English Translation</u>	<u>Notes</u>	<u>Possible explanation</u>
Les habitants des villes peuvent enfin sortir librement de chez eux...	City-dwellers can finally leave their homes freely	town lives ✓ fin lve freely	The verb 'can' or 'to be able to' is replaced by the short-hand symbol '✓'.

... ils peuvent aller loin ... they can go far in order  
chercher le calme de la nature to seek nature's calm  
✓ → far - calm nature

Standard Symbols

Dans les pays dotés d'autoroutes... In countries blessed with motorways...  
In  $\bigcirc$  s / m<sup>w</sup> The word 'country' can be replaced by a large circle

Le gouvernement allemand the German government

D govt D represents Deutschland or Germany

Depuis, dans tous les pays Since then, in all countries

Since, all  $\square$  s The word 'country' can be replaced by a square

Dans les pays dotés d'autoroutes In countries blessed with motorways

In D+ ✓ M Some interpreters use D to denote a country.

L'Autoroute

Motorways

En Europe, l'autoroute est née du chômage

In Europe, the motorway came about as a result of unemployment

Motorway

Rather than repeat the title autoroute or motorway, the familiar " symbol was used.

En Europe, l'autoroute est née du chômage

Tense

In Europe, the motorway came about as a result of unemployment

In  $\llcorner$  m'way  $\nearrow$  -t indicates the past tense.

The direction of the quadrant indicates the past tense.

Subjects' notes on VERBS

Word-for-word translation

A B C D E F

French input	In Eur.= unemployment	in (L) -t	Eur fr born u. empl	In Eu M / unemp	Euro " -born of unemployment.	Europe born of unemployment.
En Europe, l'autoroute est née du chômage	In Europe, the motorway was <u>born</u> from unemployment					
le gouvernement allemand mettait en chantier la première route à circuit-rapide.	The German government undertook the first rapid transit motorway.	& D -> 1st route	Ger Govt est 1st fast rd	D govt 1st fast road	D govt began first motorway	Germa just start 1st route
pour donner du pain à tous les sans-travail de l'après-guerre.	In order to <u>feed</u> all the unemployed people after the war.	Bread -t° > war	-bread -> uney after War	so bread - unemp p war	give	to feed post war hunger
les ingénieurs mettaient au point les plans du grand axe Hamburg-Bâle	engineers were <u>finalizing</u> the plans for the great Hamburg-Basel axis	ing° plans	devd - hambal	Hamb Bâle eng plan	give	to feed post war hunger
dont les premiers tronçons viennent d'être terminés près de 40 ans plus tard.	whose first links have just been <u>completed</u> 40 years ago.	tronçons / 40 yrs later	40 yrs later	40 yrs later	just finished 40 yrs later	(finished 40 yrs later)
l'Allemagne avait prévu le fantastique essor de l'automobile.	Germany had <u>foreseen</u> the <u>incredible</u> emergence of the automobile.	D Δ	Ger fsaw rise car	D forsaw car		Germany forecast in car
Hitler n'eût qu'à appliquer les plans existants	All Hitler had to <u>do</u> was to <u>put</u> the existing plans into effect.	.. apply exist. plans	and applied existg. plas.	Hitler only ↑ exist. plans	Hitler - carry out	Eclair had plans -
Il les poussa énergiquement.	He <u>pushed</u> them energetically	→		↗		pushed
La stratégie se retourna contre lui lors de l'invasion de l'Allemagne.	The strategy turned <u>against</u> him at the time of Germany's invasion.	strats >> lui when D invaded	backfire + invasion	strag / gsgt / D inv.	turn gin him at	against him at German invasion

(continued on next page.../)

Subjects' notes on VERBS (2)

A	B	C	D	E	F
French input	Word-for-word				
Après sa chute, il laissa 2100 kilomètres d'autoroute.	After his fall, he left behind him 2,100 kilometers of motorway.	After fall 2,100 mway	↘ 200 km Mway	2,100 kms of motorway	when left 2,100 km
Leurs caractéristiques étaient déjà celles des autoroutes modernes.	Their traits already resembled those of modern motorways.	characts = mod Ms.	charac - same	traits of modern	modern
Les ingénieurs ont introduit d'importantes modifications de détail.	Engineers have introduced important detail modifications.	eng <sup>t</sup> imp modifica	↗ details	new details	detail changes
glissières de sécurité pour empêcher les voitures de sortir de la chaussée	guard rails to prevent cars from going off the road	safety barriers	glissière securit to stop ↘	§	barriers
On s'attache maintenant à supprimer les lignes droites.	Efforts are being made to eliminate straight lines	try avoid st line	now ↓ st lines	now-trying suppress white lines	Now avoid straight lines
Pour éviter la monotonie des longs parcours.	In order to avoid the monotony of long journeys.	- monotony long	to ↓ montony	(monoton)-	(boring)
et l'on fait des plantations d'arbustes	and shrubs are being planted	trees' ⊙	-central divns - bushes	planting trees in central reser	+ trees in middle
pour que les conducteurs ne soient pas éblouis	so that drivers are not dazzled	so driver = X dazzled	to jebloui	no dazzle	to avoid dazzle
par les phares des voitures arrivant en face	by the headlights of oncoming traffic		lights opp		

(continued on next page .../)

Subjects' notes on VERBS (3)

French input	English translation	A	B	C	D	E	F
L'autoroute devient de plus en plus rapide	The motorway is becoming more and more rapid	M = faster	mo >> rapid →	M = faster	motorway quick		thus getting faster
Une nouvelle civilisation est en train de naître.	A new civilization is being born.	birth of new civil.	new civ →	= new civn. img.	new civil <sup>n</sup> ↑	new civilisation born	new civilisation
La voiture y est reine	The car is king	Car = R	car = sup	car reigns	car reigns		
Les habitants des villes peuvent enfin...	City-dwellers can finally...	town folk	+ town <sup>o</sup>	town lives ✓ fin	town dwellers	town dwellers can	freedom for town dwellers
... sortir librement de chez eux	leave their homes freely	out	→freely	live freely	freely	out -	
sans avoir au retour la punition	without having upon their return the punishment		sans punir/	w.o. p ment		sans	+ no
de devoir faire des queues interminables	of having to queue endlessly	no endless queueing back	endless queues	huge Qs	no queues to return	waiting in queues	queues at return
sans risquer leur vie à chaque carrefour	without risking their lives at every cross-road	no danger X rds	sans risk life +	w. O risking lives	no risk life carrefour	without	no risk of death X roads
ils peuvent aller loin	they can go far		→far	→far	→		→
chercher le calme de la nature	to seek the calm of nature	nature	nature's calm	-calm nature	nature calm		nature
la vie renaît dans les villages	life returns to the villages	life → in vills	vie   ages v.	villgs flourish	town life ↑	life gain in	villages return to life

(continued on next page.../)

Subjects' notes on VERBS (4)

French input	English translation	A	B	C	D	E	F
qui <u>semblaient</u> abandonnés	that <u>seemed</u> deserted		aband		aband. vill	aband villages	
Ceux qui <u>voyagent</u> pour leurs affaires for their livelihood	Those who <u>travel</u> for their livelihood			Bus travellers		prof drivers	Professional
peuvent <u>vivre</u> confortablement	may <u>live</u> comfortably	live on	live conf	live comflbly	- confor trave	can relax	comfort
sans <u>perdre</u> une seconde	without <u>losing</u> a second		(sans sec)				
sans <u>quitter</u> l'autoroute	without <u>leaving</u> the motorway	side of M	sans auto	X live Ms	not ↓ way	pull in	near m'w
Il y a <u>plus</u> de 1.100 relais- restaurants	There are <u>more</u> than 1.100 relay-restaurants	1100 stations	> 100	1-100 restaurants	100 000 relay rest.	1, 100 restaurants	1,900 rest

Types of VERBS

<u>French</u>	<u>English</u>	<u>Category</u>	<u>Verb kept</u>	<u>Symbolized</u>	<u>Omitted</u>
naître	to be born	action + intrans	3	3	0
mettre (en chantier)	to undertake	action + trans + Ex	4	1	1
donner (du pain)	to give bread	action + trans + Ex	3	0	3
mettre (au point)	to finalize	action + trans + Ex	1	1	4
terminer	to finish	action + trans	3	0	3
prévoir	to foresee	action + trans + sense	4	1	1
appliquer	to apply	action + trans	5	1	0
pousser	to push	action + trans	1	2	3
se retourner	to turn	action + intrans + reflex	2	3	1
laisser	to leave	action + trans + motion	1	0	5
être	to be	copula	0	3	3
introduire	to introduce	action + trans	0	3	3
empêcher	to prevent	action + trans + neg	1	0	5
sortir	to leave	action + trans + motion	1	0	5
s'attacher	to try	action + intrans + reflex	2	0	4
supprimer	to eliminate	action + trans + neg	3	2	1
éviter	to avoid	action + trans + neg	2	4	0
faire (des plantations)	to plant	action + trans + Ex	1	2	3
éblouir	to dazzle	action + trans + sense	6	0	0
arriver	to come	action + intrans + motion	1	1	4
devenir	to become	copula	1	3	2
être (en train de)	to be in the process of	auxiliary verb	0	2	4
naître	to be born	action + intrans	3	2	1
être	to be	copula	2	2	2
pouvoir	to be able	auxiliary	1	1	4
sortir	to leave	action + trans + motion	3	2	1
avoir	to have	auxiliary	0	1	5
devoir	to have to	auxiliary	0	0	6
faire (des queues)	to queue	action + trans + Ex	6	0	0
risquer	to risk	action + trans	4	1	1
pouvoir	to be able	auxiliary	0	1	5
aller	to go	action + intrans + motion	0	4	2
chercher	to seek	action + trans	0	0	6
renaître	to be reborn	action + intrans	3	3	0
sembler	to seem	copula	0	0	6
voyager	to travel	action + intrans + motion	3	0	3
pouvoir	to be able	auxiliary	1	2	3
vivre	to live	action + trans	4	0	2
perdre	to lose	action + trans + neg	0	1	5
quitter	to leave	action + trans + motion	1	1	4
			0	0	6

Verb Analysis:

At a first glance, interpreters' notes seem to retain very few verbs. Therefore, the first area of examination included a verb count. To facilitate the analysis, one of the three input texts was selected, namely 'L'Autoroute' ('The Motorway'). This particular text contained 378 words altogether in its French input version. Of the 378 words, there were 41 verbs. Page 228 presents the number of verbs retained in the notes, those that were symbolized and those that were altogether omitted.

Results indicated that 30% of verbs were kept; 22% of verbs were symbolized and 48% were completely omitted. By merging the verbs that were kept (30%) and those that were symbolized (22%), it appears as though 52% of verbs are retained in some form or other in the notes, be it a symbol or an abbreviated form of the verb, and that 48% are omitted.

From the above-mentioned results, it appears that half of the verbs are omitted, which is a fairly high percentage. In order to determine what type of verbs were omitted, a further breakdown was undertaken to determine if certain verbs were retained more frequently than others.

Of the 41 verbs present in the text entitled "The Motorway", 30 were action verbs, such as to give; to live; to apply; to introduce, etc. Among these action verbs, 22 were transitive action verbs (that is, having a direct object, such as: to give bread, for example) and 8 were intransitive action verbs (without a direct object, such as: to be born; to arrive, etc). The verbs also included 6 auxiliary verbs (can, must, to be able to) along with 4 copula verbs (such as: to be; to become; to seem) and finally, 1 impersonal verb (there are).

The verbs most frequently omitted were the auxiliary verbs:  
(76%) "



"They can go far"

Subject A:  
Subject B: → far  
Subject C: ✓ → far  
Subject D: →  
Subject E:  
Subject F: →

The next group of verbs to be omitted was the copula verb (51% were omitted):

"Their traits already resembled those of modern motorways".

Subject A: = modern Ms  
Subject B: ch=<sup>CS</sup> rte mode  
Subject C: characts = mod Ms.  
Subject D: charac same -  
Subject E: traits - of modern  
Subject F: modern

The group of verbs most frequently retained were the transitive action verbs: (only 37% were omitted).

"All Hitler had to do was to apply the plans" (or 'implement')

Subject A: Hitler follow  
Subject B: . . apply exist. plans  
Subject C: and applied existg. plas.  
Subject D: Hitler only ↑ exis plans  
Subject E: Hitler carry out  
Subject F: E clair had plans

followed by intransitive action verbs (35% of which were omitted).

"A new civilization is being born"

Subject A: birth of new civil.  
Subject B: new civ<sup>n</sup> → )

Subject C: = new ciyn. img.  
Subject D: new civil<sup>n</sup> ↑  
Subject E: new civilisation born  
Subject F: new civilisation

Further categorizations were made but insufficient data did not allow any further generalisations. For example, certain verbs denoting a negative aspect or an absence of something were often transcribed with a large "X" in the subjects' notes: for example, verbs such as "to eliminate straight lines" were recorded in the notes as:

Subject B: now X st. line  
Subject D: now ↓ st line

Other verbs which fell into this "negative" category were: to prevent; to avoid; to lose; to leave. The last verb, however, could also belong to another category of verb labelled "verbs of motion" which included such verbs as "to give; to foresee; to push; to leave; to go out; to arrive; to travel".

"They may go far..."

Subject B: →far  
Subject C: ✓ → far  
Subject D: →  
Subject F: →

There was one or possibly two graphic verbs which were duly recorded as such by subjects. For example, the transitive action verb "to foresee" also contained an element of motion (in the sense that one sees into the future, but more important, it held a very high imagery content, something labelled as sensory in the verb classification.

"Germany had foreseen  
the emergence of the  
automobile".

Subject A: Germ see ↗ car  
Subject B: D ↙ ↗ car

Subject C: Ger fsaw rise car

Subject D: D forsaw ↗ car

Subject F: Germany forecast ↗ im car

The last graphic verb "to be dazzled" (by the lights of oncoming traffic) was simply represented as:

Subject A: ○ ○

To recapitulate, the six interpreter subjects transcribed 16% of the incoming information into symbols.

The symbols most frequently used were 1) arrows, 2) standard symbols (for 'country' and 'Germany'), mathematical symbols (=, +, <, >), symbols denoting negation, and finally fraction symbols to denote the partitive or genitive.

The verb seemed to be the type of word most frequently omitted (48%), kept (30%) or symbolized (22%). Following a similar breakdown of nouns and adjectives which will follow, the verb was the item most frequently symbolized.

The verbs most frequently retained were the transitive action verbs, followed by the intransitive action verbs. The verbs most frequently omitted or symbolized were the auxiliary verbs followed by the copula verb.

Further research is recommended to examine certain verbs denoting a negative and all verbs of motion.

#### Noun analysis:

Following the verb count, a similar analysis was performed on the nouns taken from the same text, "The Motorway". See pages 235 through 237 for an itemization of the 90 nouns present in the French version of the input text, along with the English equivalent. The last six columns, A through F, list the actual note made by each of the six subjects for each of the nouns. The final three columns indicate whether the subject actually noted the noun or simply omitted it.

The total number of French nouns in the input passage included 90 nouns. Since there were six subjects, the number of possibilities was  $90 \times 6$  or 540. Results indicate that of the 540 possibilities, 345 items were retained as such in the notes (meaning that the noun was somehow represented in the subjects' notes, be it the entire noun, an abbreviation or even the first letter of the noun). In other words, 64% of the nouns were represented in the notes.

Of the 540 possibilities, only 36 were symbolized: that is to say that the noun itself was replaced by a graphic symbol. This figure represents only 7% of the original nouns.

Finally, of the 540 possibilities, 159 items were omitted completely: this figure represents 29% of the input nouns.

By merging the first two results, nouns kept and nouns symbolized, (64% and 7% respectively), 71% of the nouns were recorded in some form or other, be it nominally or symbolically.

From the above results, it appears as though two thirds of the nouns are recorded, a much higher percentage than is the case for verbs.

It is also interesting to note the minimal number of nouns that were symbolized. Among the few that were, some generalizations can be made:

. Countries were often symbolized: for example, 'Germany' was frequently replaced by the symbol 'D' (presumably for 'Deutschland').

. Certain nouns which contained a notion of movement were often replaced by symbols. For instance the word 'chute' (fall) was replaced on two occasions by an arrow pointing downwards: ↓

Another such example was the word 'essor' (boom) which was replaced by a symbol in four out of six cases:

Input noun 'essor' (boom)	Subject A: ↗
	Subject B: ↗

Subject D: ↗

Subject F: ↗

Another noun was symbolized by one subject consistently throughout the entire passage: whenever the text made mention of employment, unemployment or the unemployed, subject B used a symbol (t) in each case. For example, 'employment' was replaced by 't' ('t' stood for either 'toil' or French 'travail'). Therefore, 'unemployment' became '-t' (minus t) and the 'unemployed' became 't<sup>o</sup>', where the degree sign meant 'plus human'.

Finally, one word was symbolized by three of the six subjects 'carrefour' or 'crossroads':

Subject A: X s

Subject B: +

Subject F: Xroads

Probably the most original symbol was the one devised on the spur of the moment by subject A upon hearing the French noun 'phares' or 'headlights' in the sentence:

"... so that drivers would not be dazzled by the lights of on-coming traffic". Subject A noted this phrase as:

Subject A: so not blinded ○ ○

### Discussion:

The mean probability that a subject would deliver consecutively an item that appeared in his or her notes was .97 whereas the probability of delivering an item that was not present in the notes was .23. The mean probability that a subject would recall an item that appeared in his or her notes was .81 whereas the probability of recalling an item that was not present was .12.

Both these findings support Crawford's (1925a) notion that

"taking notes on a point does not guarantee its being recalled at the time of the quiz but failing to take note of it very greatly decreases its chances of being recalled" (page 289)

Noun Analysis (1)

nouns

French input	English	A	B	C	D	E	F	kept symbol	omitted
<u>Title:</u>									
L' autoroute	motorway	M ways	Motorways	MM ways	M way	Motorway	The Mway	0	0
Europe	Europe	Eur	LL	Eur	Euro	Euro	Europe	0	0
l' autoroute	motorway				"	"	-	3	2
chômage	unemployment	unemploy	-t	u. empl	unemp.	unemploy	unemployment	1	0
sortie	exit	out of	after	ex	exit	out of	exit	0	0
Berlin	Berlin	Berlin	Berlin	Berlin	Berlin	Berlin	Berlin	0	0
gouvernement	government	Govt	route	Govt	govt	Govt	route	0	2
route	road	m way		rd	road	motorway		0	0
circulation	circulation							0	6
pain	bread	feed	bread	bread	bread		feed	0	1
sans-travail	unemployed	starvers	-t	uney	unemp		hunger	1	1
l' après-guerre	post-war	post-war	> war	after War	p. War		postwar	1	1
ingénieurs	engineers	plans	ing		eng			0	4
plans	plans	plan	plans		plan		plans	0	2
axe	axis							0	6
Hambourg-Bâle	Hamburg-	Hamburg-			Hamburg-	Hamburg-	Hamburg-	5	1
	Basel	Bale		hambal	Bâle	Basle	Bâle	2	4
tronçons	links	link	tronçons					0	0
ans	years	yrs.	y	yrs	yrs	yrs	yrs	6	0
crise	crisis	cris	crise	crs	cris	crisis	Germany	5	1
Allemagne	Germany	Germ	D	Ger	↗		↗	3	2
essor	emergence	↗	↗	rise	↗			1	1
automobile	automobile	car	car	car	car		car	5	1
Hitler	Hitler	Hitler	plans	plas	Hitler	Hitler	Eclair	4	2
plans	plans	cos	se		plans	reasons	plans	4	2
raisons	reasons	prestige	se	prestige	prest		prestige	1	3
prestige	prestige	strategy	strates	motives	strag	strategic		5	1
motifs	motives	lose	invaded	strat	inv.			1	5
stratégie	strategy	strategy	D	invasion	strag	strategic	strategy	6	0
invasion	invasion	lose	D	invasion	inv.		invasion	5	1
Allemagne	Germany	out	fall	fall	D		German	1	3
chute	fall	out	fall		↘		↘	3	1
kilomètres	kilometers	kilos	km		km	kms	km	5	1

Noun analysis (2)

French input	English	A	B	C	D	E	F	kept	symbol	nouns omitted
autoroutes { caractéris- tiques }	motorways { caracté- ristics }	M	mw <sup>cs</sup> ch	mway characts	Mway charac	motorway traits		5	0	1
autoroutes	motorways	Ms		Ms.		single	single	4	0	2
voies	ways	l-ways	one way	l-way	voies uniq	direct	carriageways	6	0	0
points noirs	black spots	black spot	pts noir	bl spots	black spots	point noir	black points	6	0	0
pays	countries		ing	ing				0	2	4
ingénieurs	engineers	chge		eng			changes	3	1	2
modifications	modifications	détail		modifica	details	details	detail	5	0	1
détail	detail	hard	dét	safety	glissiere		barriers	6	0	0
{ glissières de sécurité }	{ guard- rails }	hard	hard	barriers	securit					
voitures	cars	shoulders	shoulders							
chaussée	pavement							0	0	6
signalisations	signs	signs	signs	signs	signs	signs	sign posts	6	0	0
éloignement	removal	out	X	X	no	no	get rid of	4	2	0
obstacles	obstacles	obsts	obstacles	obstacles	obst	obstacles		5	0	1
lampadaires	lamp posts	lamps	(lamps)	lamps	lamps	lamposts	lamps	6	0	0
piles de pont	pilons			pils				1	0	5
{ bornes kilométriques }	{ milestones }	milestones		km mon	kms		milestones	4	0	2
lignes	lines		lines	line	lines	lines	lines	5	1	0
monotonie	monotony	monot	boredom	monotony	monotony	(monton)	(boring)	6	0	0
parcours	course									
plantations	plantations				bushes	planting		1	0	5
arbustes	shrubs	shrubs	bushes	trees	divns	trees	trees	6	0	0
terre-plein	reservation				lights	reser	middle	3	0	3
conducteurs	drivers							0	0	6
phares	headlights							1	1	4
voitures	cars							0	0	6
autoroute	motorways	M	mo	M	mway			4	0	2
pays	countries	cys	cs	P.	□ s	Os	Countries	2	4	0
autoroutes	motorways	civil	m w <sup>n</sup>	M	M way <sup>n</sup>	motorway	m'way	5	0	1
civilisation	civilization	civil	civ <sup>n</sup>	civn	civil	civilisation	civilisation	6	0	0
loisirs	leisure	leisure	leisure	leis.	leisure	leisure	play	6	0	0
travail	labour	work	t	wk	wk		work	4	1	1

(continued on next page.../)

French input		Noun analysis (3)							Nouns	
English	A	B	C	D	E	F	kept	symbol	omitted	
voiture	car	car	car	car	car	car	5	0	1	
reine	R	sûp <sup>o</sup>	reigns	reigns	dwellers	dwellers	4	1	1	
habitants	folk	town <sup>o</sup>	lives	dwellers	town	dwellers	5	1	0	
villes	town	town	town	town	return	town	6	0	0	
retour	back					return	3	0	3	
punition		punir	p ment				2	0	4	
queues	queing	queues	Qs	queues	queues	queues	6	0	0	
vie	life	life	lives	life		death	4	0	2	
carrefour	Xs	+	clam	carrefour		X roads	1	3	2	
calme		calm	nature	calm			4	0	2	
nature	nature	nature	nature	nature		nature	5	0	1	
rayon	round	radius	rnd.		radius	near	5	0	1	
kilomètres	kilos	km	km	km	kms	km	6	0	0	
villes	town	ville	towns	towns	town	towns	6	0	0	
vie	life	vie	(flourish)	life	life	life	6	0	0	
villages	vills	villages	villg	vill	villages	villages	6	0	0	
affaires	business	business	business	business	drivers		4	0	2	
routiers	business	routier	drivers	haulers	lorry	lorry				
voyageurs	salesmen		sales		drivers		5	0	1	
industriels	industry	I <sup>st</sup>	reps		reps	traveller	4	0	2	
seconde	second	sec	industs		indus		4	0	2	
autoroute	M	auto	Ms			m'way	1	0	5	
Allemagne	Germ	D	way			Germany	5	0	1	
relais-	stations	rel	restau-	relay	restau-		2	1	3	
restaurants	stations	rests	rants	rests	rants	rest	6	0	0	
motels	motels	mote-	motels	motels	motels	motels	6	0	0	

Total = 345 36 159

Total number of nouns in French input n=90



The type of notes taken by the consecutive interpreter-subjects did not seem to be an indication as to whether an item would reappear in the consecutive delivery or during subsequent recall. In other words, according to Howe's (1970) formula of an efficient note-taker, no correlation was found between the following ratio:

$$\frac{\text{number of items reproduced in notes}}{\text{number of words in notes}}$$

and meaningful recall, whether the number of items reproduced in the notes included symbols, words written out in their entirety or abbreviations. Therefore, it is not the type of note which is the key factor in note-taking but rather the mere presence of the note itself. This result supports McClendon's finding (1958) that it made no significant difference in listening comprehension whether subjects did not take any notes, whether they took notes only on the main points of the lectures, whether they took extensive, detailed notes on the fine factual details of the lecturer or whether they simply took notes in their customary manner.

Therefore, there seems to be no justification for restricting a student from taking notes during lectures on the basis that it interferes with efficient listening neither is there any justification for advocating one note-taking method over another on the grounds that one method is more conducive to effective listening comprehension than any other method.

However, straight-forward correlations between the following categories did uncover some interesting facts. For example, the total number of words present in subjects' notes (which included symbols, words written out in their entirety, etc.) had more of an effect on subjects' consecutive delivery:

$$r = .44$$

than on subjects' recall:

$$r = .26$$

although no correlation was significant.

The fact that subjects used a lot of symbols in their notes had a reverse effect. In other words, the number of symbols present in an interpreters' notes seemed to have more impact on subjects' recall

$$r = .69$$

than on consecutive delivery.

$$r = .42$$

Similarly, the number of words written out in their entirety had a direct influence on both recall and consecutive delivery, but more noticeable for the former

$$r = .58 \quad (\text{for recall})$$

than for the latter.

$$r = .36 \quad (\text{for consecutive delivery})$$

Since consecutive interpreters are never asked to recall any material following consecutive delivery, the previous findings are of little interest to most interpreters.

Further, since interpreters are encouraged to develop their own style of notes, no immediate provisions can be made at the moment to include any of these results in a curriculum designed to train interpreters for consecutive interpretation.

#### Adjective count:

The final word count was performed on adjectives. The text "The Motorway" included 24 adjectives. The first column includes the adjectives in French as they were heard by the subjects. The second column provides a translation of the adjectives. The next six columns present the actual notes made by six subjects for every adjective. The last three columns present the number of adjectives that were symbolized in the notes and, finally, those that were omitted. Adjectives are presented on page 242.

There were 24 adjectives in the text and there were six subjects under study. Therefore, the number of possibilities was  $24 \times 6$  or 144.

Of the 144 possibilities, 86 adjectives were recorded in the subjects' notes, that is 60%; 15 adjectives were symbolized which represents only 10%. Finally, 43 adjectives were totally omitted, that is 30%. If we merge the possibilities that were recorded as such and those that were symbolized, we see that in fact, 70% of the input adjectives were kept, be it in their adjectival form or in a symbolic form, compared to 30% which did not appear in the notes whatsoever.

These results are strikingly similar to the percentages obtained following the noun count where 71% of nouns were kept and 29% were omitted.

Among the adjectives most frequently symbolized, again, some generalizations were made:

. the adjectival form of countries was often symbolized. For example, "German" became "D" in half the cases:

French input: "allemand"	Subject A: Germ
English: "German"	Subject B: D
	Subject C: Ger
	Subject D: D
	Subject E: D
	Subject F: Germa

. numerals were almost always symbolized, although in one case, Subject E actually took the time to write out 'first', whereas the other five subjects simply used the numeric symbol "1":

French input: "première"	Subject A: 1st
English "first"	Subject B: 1st
	Subject C: 1st
	Subject D: 1st
	Subject E: first
	Subject F: 1st

For the adjective "économique", or "economic", surprisingly only one symbol was used, whereas in other cases, the abbreviated

form was retained.

French input: "économique"	Subject A:	econ
English: "economic"	Subject B:	$\Sigma$
	Subject C:	ec
	Subject D:	econ
	Subject E:	econ

One graphic symbol was used for the French "ligne droite" or "straight line". Interestingly, one subject actually put down "white" in his notes.

French input: "lignes droites"	Subject A:	straight
English: "straight lines"	Subject B:	_____ (drew a line)
	Subject C:	st
	Subject D:	st
	Subject E:	white
	Subject F:	straight

In conclusion, it appears likely that the information presented to a consecutive interpreter will a) be represented in his notes (89%) but especially during the consecutive delivery (93%), followed by a substantial drop for recall without notes (55%).

Notes are made up of a) words written out in their entirety (49%) b) abbreviations (28%); c) symbols (16%) and d) digits (7%). The words consisted of prepositions, nouns, adjectives, verbs, adverbs and pronouns. Symbols consisted on arrows, brackets, symbols denoting emphasis, symbols representing the genitive, graphic symbols, mathematical symbols, symbols to represent negation, short-hand, standard symbols and symbols to represent tenses.

Following a verb count, it appeared that 53% of the verbs are retained (both in their entirety and in symbolized form). Auxiliary verbs were most frequently omitted or symbolized (76%), followed by the copula verb (51%), followed by the transitive action verbs (37%) and lastly, by the intransitive action verbs (35%). Words counts performed on nouns revealed that 64% of nouns are represented in the notes; 60% of all adjectives are represented in the notes.

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Adjective Analysis

adjectives  
kept symbol omitted

French adjective	English	A	B	C	D	E	F	kept	adjectives
allemand	German	Germ	D	Ger	D	D	Germa	3	3
première	first	1st	1st	1st	1st	first	1st	1	5
rapide	rapid or fast			fast	fast			2	0
grand	large or big							0	0
premiers	first							0	0
économique	economic	econ	Σ	ec	econ	econ		4	1
fantastique	fantastic							1	1
existants	existing			existg	exist	ex	im	3	0
stratégiques	strategic	strategy	strates	strat	strag	strategic	strategy	6	0
modernes	modern	modern	mode	mod	strag	modern	modern	5	0
uniques (voies)	one (way)	1 ways	one way	1 way	unq	single	single	4	2
noirs	black	black	noirs	bl	black	noirs	black	6	0
importants	important			impt	→	new		2	1
géantes	gigantic	lge	large	hge	giant	large	huge	6	0
{ (bornes)									
{ kilométriques }	milestones	milestones		km	kms		milestones <sup>4</sup>	0	2
droites	straight		st	st	st	white	straight	5	1
longs	long			long				1	0
central	central	middle	central	⊙	central	central	middle	5	1
rapide	rapid	faster	rapid	faster	quick	central		4	0
sûre	safe	safer	sur	surer	safer	certain	faster	6	0
fatigante	tiring	tiring	tiring	tiring	tiring	tiring	tiring	6	0
nouvelle	new	new	new	new	new	new	new	6	0
interminables	endless	endless	endless	huge				3	0
abandonnés	abandoned		aband		aband	aband		3	0

Total number of input adjectives n = 24

Total: .86 15 43

n =

Step A: What happens between the Input and the Note-taking stage?

Out of an input of  $\bar{X} = 90.33$  meaning units (or 100%), a mean number of 66.94 units are recorded in the subject's notes, a figure which represents 73% of the original source material.

A closer examination of the type of items that were omitted when notes are being made indicate that 33% of the nouns are dropped; 41% of the adjectives are dropped; 78% of the prepositions are eliminated; 62% of the adverbs are dropped; 96% of the pronouns are dropped; 3% of the digits are dropped; 72% of the verbs are dropped, but when verbs and symbols replacing verbs are taken into account, then only 55% of the verbs were dropped. (See page 242).

Several things can happen between the moment the subject hears the French input material and the moment his note-taking task is completed.

- . There may be the presence of a note, in some form or other;
- . There may be an abbreviation of the source item;
- . There may be a symbol replacing the item;
- . There may be an omission either intentional or accidental;
- . There may be a transformation of some sort;
- . There may also be an error;

Let us examine each possibility individually.

The presence of an item:

From the above word counts, it appears as though 71% of the nouns are kept, 70% of the adjectives are kept and only one out of two verbs kept or replaced by a symbol.

Example:

French: "En Europe, l'autoroute  
est née du chômage".

Notes

"Europe \_\_\_\_\_  
born of unemployment"

English: "In Europe, the motorway  
came about as a result of unemployment".

Here is an example where the motorway was replaced by a line to indicate that it had just been referred to in the title; the article "l'" was dropped; the copula verb 'was' was deemed un-

Step A: What happens between the Input and the Note-taking phases?

	<u>Input (in French)</u>	<u>Note-taking (in English)</u>
Meaning units:	X = 90.33	X = 66.94    73% kept    27% dropped
Nouns:	X = 101.67	Nouns:    X = 67.89    67% kept    33% dropped
Adjectives:	X = 40.67	Adjectives:    X = 23.89    59% kept    41% dropped
Prepositions:	X = 76.67	Prepositions:    X = 16.55    22% kept    78% dropped
Adverbs:	X = 17.33	Adverbs:    X = 6.55    38% kept    62% dropped
Pronouns:	X = 23.33	Pronouns:    X = 1.00    4% kept    96% dropped
Digits:	X = 12.00	Digits:    X = 11.67    97% kept    3% dropped
Verbs:	X = 38.67	Verbs alone:    X = 10.67    28% kept    72% dropped Verbs and symbols:    X = 17.33    45% kept    55% dropped

Table IV - 5

Step A: What happens between Input and Note-taking?

necessary; along with the preposition "en" for "in Europe".

Furthermore, the presence of an item did not necessarily mean that the entire word needed to be written out. As mentioned earlier, only 49% of the items were recorded in their entirety in a subject's notes whereas 28% of the items were abbreviated.

The abbreviation of an item:

As mentioned above, of all the items recorded by the subjects in their notes, 28% were written in an abbreviated form. Abbreviations comprised any item which deviated from the standard and entire spelling. Such abbreviations could include the first letter of an item:

'l' autoroute'... 'the motorway'.. 'm' (in the notes)

It could include the first and last letter of an item:

'travail'... 'work'... 'wk' (in the notes)

Abbreviations also included what could have simply been an item having been misspelled:

'avait prévu'... 'foresaw'... 'forsaw' (in the notes)

Results indicated that prepositions are rarely abbreviated. Since prepositions are generally quite short, it is understandable that they are usually written out in their entire form: 'of', 'in', 'on', 'to' being the most common examples. However, for the longer prepositions, subjects did resort to abbreviations: 'sans' in French is shorter than its English equivalent 'without'. Four subjects opted to use the short negative symbol either by writing 'no' or simply by drawing a large cross through the item that was to be eliminated. For example,

'sans avoir au retour  
la punition de devoir  
faire des queues interminables'

'... without having to face  
the punishment of endless  
queues when returning'

'X'

But two subjects opted to retain the notion of 'sans' as presented in the original input. One subject simply kept 'sans' as she felt it was shorter than 'without' and the other, simply re-wrote 'without' as w.o.



Verbs were also rarely abbreviated. Those that were were abbreviated very carefully so that subjects would be able to rely on the ending of the verb to denote the right tense. Examples of verbs that were abbreviated were, as mentioned above,

'avait prévu'... 'foresaw or had foreseen'... 'forsaw' (in the notes)  
... 'fsaw'



'peuvent sortir librement de chez eux'... 'can finally leave their homes' '✓fin lve freely'

'une nouvelle civilisation est en train de naître' ... 'a new civilization is emerging' ... '= new civn img.'

The items which were most frequently abbreviated therefore, were the nouns, the adjectives and the adverbs. In addition to the fact that they were more numerous than verbs and were therefore more likely to be abbreviated, other explanations are also possible.

The first suggestion is that any noun repeated several times in the same text becomes redundant. Subjects wrote out the title of the passage as "The Motorway" once. Thereafter, whenever the input passage mentioned the word 'motorway', all subjects made a note of it as 'm'way', 'M', 'm' and 'mw'.

Some nouns lent themselves to a phonetic abbreviation. For example, a 'queue' did not need to be written out as such, but could very easily be replaced by the letter 'Q'. In another instance, the French input being 'voies uniques', one subject transcribed it in his notes as 'voies uniq', probably as a result of not being able to come up with an immediate and accurate translation: 'one-way or single carriageway'.

A third type of abbreviation included the most common terms that seem to reappear over and over again in any text. Such items included the nouns 'government' which was always abbreviated to 'govt' or 'gv'; 'countries' which was either replaced by the symbol  or  but also abbreviated as 'cys'; 'unemployment' which was cleverly abbreviated by one subject as '-t'; 'kilometers'

which was invariably abbreviated to 'km', 'kms' and even, in one instance, to 'kilos'.

The symbolization of an item:

Another event which occurred between the input and note-taking phase was replacing certain items by symbols. Out of the total number of items collected in the six subjects' notes, 16% were symbols. The item most frequently symbolized was the verb, especially the auxiliary and copula verb, which was either replaced by the mathematical equal sign '=' or was simply omitted. Auxiliary verbs were often omitted entirely or replaced by the shorthand symbol '✓'. Other types of verbs more readily symbolized were verbs containing a notion of movement which were replaced by some type of arrow. Finally, verbs implying some form of negation or absence of something seemed to be replaced by an 'X' to denote negation.

Nouns were not symbolized as frequently as verbs although some patterns did nevertheless emerge. As mentioned earlier, names of countries were often symbolized. In this instance, the country in question was Germany and if it was not abbreviated to 'Ger' or 'Germ', it was certainly replaced by the initial of its German counterpart, 'D'.

Other nouns with graphic connotations were often symbolized: 'crossroads', for example, was often rewritten as 'X roads' in the subjects' notes. Other nouns which evoked a notion of movement or direction were replaced by an arrow: 'the emergence of the car' for example, was rewritten as '↗ car'.

The final category examined was the adjective. Only 10% of the input adjectives were symbolized and again, their pattern followed that of the symbolized noun. For example, the adjective "German" as in the "German invasion" was replaced by the symbol 'D' as was the case in the nominal form. Ordinal adjectives were usually replaced by the digital form: 'first' became '1st'; adjectives relating to size or importance were also replaced

by an appropriate symbol such as ' ↗ ' for 'fantastic' or '        ' for 'gigantic'.

Omission of items:

Using Barik's (1975) definitions of omissions as a guideline, several types of omissions were noted between the input phase and the note-taking phase.

. a skipping omission was defined as the omission of a single lexical item such as a qualifier or short phrase which was present in the input material but which did not appear in the subject's notes. There were two types of skipping omissions: accidental ones and, more difficult to judge, intentional omissions. An omission was defined as intentional if the item omitted in the notes reappeared later on in the consecutive delivery. Both intentional and accidental omissions, however, did not alter the meaning of the input material in any way.

. a comprehension omission was defined as the omission of a larger unit of items due to the subject's inability to understand the source material, resulting in a loss of meaning or in some type of disjointed note-taking sequence. Contrary to Barik's classification however, this category did not include those items that the subject was unable to translate on the spur of the moment.

. a compounding omission was defined as an omission associated with the subject's regrouping or compounding the elements from different clauses, resulting in a series of notes with a slightly different meaning from the original one although the main gist was retained.

. a total omission was regarded as the omission of several items in the source material seemingly due to the fact that the subject was either unable to keep up with the pace of the source material or that he felt it was unnecessary to make note of it at the time, but then failed to deliver such an item during consecutive delivery. This category also implied some kind of departure from

the original meaning and caused a disjointed consecutive delivery.

Results indicate that among the three texts presented to the nine subjects, there were 63 instances of omissions between the input and the note-taking phase.

Of the possible 63 omissions, 20 or 32% were skipping omissions. These were labelled as accidental omissions. For example:

"Ils peuvent sans perdre une seconde, vivre confortablement sans quitter l'autoroute".

"They may, without wasting a second, live comfortably without leaving the motorway".

Notes:

✓ live comfortably

X live Ms

Eight instances were noted of intentional skipping omissions since although the items disappeared in the notes, they later re-appeared in the consecutive delivery. These 8 intentional skipping omissions represented 13% of all types of omissions. For example:

"... pour que les conducteurs ne soient pas éblouis par les phares des voitures arrivant en face."      "... so that drivers would not be dazzled by the headlights of oncoming traffic."

Notes

so not blinded ○○

In the category labelled comprehension omission, 11 such cases were recorded, that is 17% of all possible omissions.

"... dont les premiers tronçons viennent d'être terminés."

"... whose first segments have just been completed."

Notes

tronçons

(which came out in the consecutive delivery as: "plans which still bore fruit").

The number of omissions labeled compounding omissions also amounted to 11 or 17% of all possible types of omissions. For example:

"... pour éviter la monotonie  
des longs parcours".

"... in order to cut down on  
the monotony of lengthy jour-  
neys".

Notes

stop monot

(which came out during consecutive delivery as: "This is done with  
a view to cutting down the monotony of motorway travel").

The final type of omissions was the total omission which  
accounted for 13 cases or 21% of the total number of possible  
omissions. For example:

"... glissières de sécurité  
pour empêcher les voitures  
de sortir de la chaussée".

"... safety ramps to prevent cars  
from going off the road".

Notes

hard shoulders

which came out during consecutive delivery as: "... such as the  
introduction of safety hard shoulders).

"... piles de pont" was omitted by all subjects both in the notes  
and in consecutive delivery.

"... la vie renaît dans les  
villages qui semblaient aban-  
donnés".

"...life is returning to the  
villages which had seemed de-  
serted".

Notes

life → in vills

(which was rendered in consecutive delivery as: "... life has  
therefore come back to the little villages").

Transformation of items:

Transformations referring to a departure from the original  
text in the notes were classified as:

. a misinterpretation of the stimulus phrase and recorded as such  
in the notes. If no rectification of the misinterpreted notes  
occurred in the subsequent consecutive delivery, then the item  
misrecorded in the notes was labeled as a misinterpretation.

For example:

"Hitler n'eût qu'à appliquer  
les plans existants".

"Hitler needed only to imple-  
ment the existing plans".

Notes

Eclair had plans

Consecutive delivery:

"Mr. Eclair..."

Out of a total number of 14 transformations of items, 6 were la-  
beled as misinterpretations, a figure which represented 43% of all  
possible transformations.

. an inference referred to a type of elaboration of an item or a  
clause not specified in the original. Two types of inferences  
were found:

- 1) those that did not significantly alter the meaning of the ori-  
ginal;
- 2) those that significantly altered the meaning of the original.

Example 1:

"... pour donner du pain à tous  
les sans-travail de l'après-  
guerre".

"... in order to feed all those  
who were unemployed after the  
war".

Notes

feed post war starvers

Consecutive delivery

"This was done in order to provide jobs and therefore food to  
thousands of people who were left starving after the war".

Example 2:

"On s'attache maintenant à  
supprimer les lignes droites".

"Efforts are being made in order  
to eliminate straight lines".

Notes

now trying suppress white line

Out of a total number of items which were transformed, 3 did not  
alter the meaning of the original (21%) and 2 did (14%).

. an alteration was defined as a transformation which took place  
in the notes which was neither an elaboration or a misinterpreta-

tion but which nevertheless altered the original meaning intended in the input material. For example:

"Sans risquer leur vie à chaque carrefour..."      "Without risking their lives at every road junction..."

Notes

no danger X rds

Consecutive delivery

They do not have the danger of endless crossroads and traffic lights.

Out of 14 note transformations, only three were considered as alterations, that is 21%.

Errors:

Following Barik's (1975) classification, five categories of errors were recorded:

. a mild semantic error or MS: was defined as an error or inaccuracy of some lexical item found in the notes which only slightly altered the intended meaning when verified in the subject's consecutive delivery. The inaccuracy is restricted to the lexical item or expression and does not necessarily affect the rest of the unit of which it is part. For example:

"En même temps, les ingénieurs mettaient au point les plans du grand axe Hambourg-Bâle".

"At the same time, engineers were finalizing the plans for the large Hamburg-Basel link road".

Notes

+ devd - hambal

Consecutive delivery

Thus they developed a chief route called the Bourghal.

In all three input texts, 28 errors were recorded among subjects' notes. Of the 28 possible errors, there were seven instances of mild semantic errors, that is 25%.

. a gross semantic error (GS) was defined as an error in the transcription of some lexical item which substantially changed the mea-

ning of the original. Here again, the error is primarily in terms of a specific item and does not affect the rest of the unit. For example:

"La population mondiale accroit par suite d'un mouvement naturel".	"World population increases as a result of a natural movement".
---	---

Notes

⊖ pop ↗ foll (nat<sup>1</sup>) mvt

Consecutive delivery

The world population grows according to national movement.

The error lay in the transcription of the adjective 'natural' as 'nat<sup>1</sup>', therefore probably understood by the subject as 'natural' when the notes were being taken (transcription error) but delivered as 'national' (gross semantic error). Consecutive interpreter-subjects are often warned against the hazards of abbreviations because of such commonly occurring errors.

In all three input texts, out of the 28 errors recorded in the notes, there were 7 instances of gross semantic errors (GS) or 25%.

. a mild phrasing change: the interpreter does not record in his notes what the original message contained, but the gist of what is said is not affected. This category was labeled "MP".

For example:

"Il faut connaître le problème des statistiques sur la consommation de la drogue..."	"One must understand the problem of statistics concerning drug usage..."
---	--

Notes

must real prob of stats  
on drug prob

Consecutive delivery

It is necessary to come to terms with the problem of statistics on the whole drug problem".

Out of the 28 errors in subjects' notes, only 4 instances of mild phrasing changes were recorded, that is 14%.



. a substantial phrasing change is where in addition to recording an erroneous mnemonic, the departure leads to a difference in meaning. This category will be referred to as "SP". For example:

"... peuvent sans perdre une seconde " ... can, without wasting one  
vivre confortablement sans quitter second, live comfortably  
l'autoroute". without leaving the motorway".

Notes

live on side of M

Consecutive delivery

... can live quite easily right on the side of the motorway.

. a gross phrasing change consisted in a departure in the notes that represented a considerable difference in meaning and was therefore totally erroneous. This category was labeled as "GP".

For example:

"En Amérique Latine, les taux records résultent d'une mortalité relativement faible". "In Latin America, the record rates are due to a relatively low mortality rate".

Notes

In L A record reached fr low death

Consecutive delivery

In Latin America, there has been a record rate of mortality.

Of the 28 errors found in subjects' notes for all three texts, only three instances of gross phrasing changes were recorded, which represents 11% of the total.

From an input of  $\bar{X} = 90.33$  meaning units ( or 100%),  $\bar{X} = 66.94$  (or 73%) meaning units reappeared in the notes. Skipping omissions albeit accidental, represented the greatest loss of information (32%) followed by total omissions. Items most frequently dropped were pronouns (96%), followed by prepositions (78%), followed by adverbs (62%), verbs (55%), adjectives (41%), nouns (33%) and digits (3%).

---

Step B: What happens between the Note-taking phase and Consecutive delivery?

Out of an input of  $\bar{X} = 90.33$  meaning units (or 100%), it appeared in the previous section that  $\bar{X} = 66.94$  units (or 73%) were recorded in the consecutive notes. This section indicates that the number of meaning units present in the consecutive delivery rises from  $\bar{X} = 66.94$  to  $\bar{X} = 77.42$ , in other words, 86% of the original input. See page 257.

A closer examination of the type of items that reappear during the consecutive delivery phase indicates that:

. the mean number of words in the notes was  $\bar{X} = 175.11$ , whereas in consecutive delivery, the mean number of words is  $\bar{X} = 427.78$ , an increase by a factor of 2.44.

In the same vein, the mean number of meaning units recorded in the notes was  $\bar{X} = 66.94$ , whereas during consecutive delivery, the mean number rises to  $\bar{X} = 77.42$  or 1.16 times.

The mean number of nouns went from  $\bar{X} = 67.89$  to  $\bar{X} = 110.67$ , or 1.63 times. The number of adjectives rose from  $\bar{X} = 23.89$  to  $\bar{X} = 35.33$  (1.48 times). The number of prepositions rose from  $\bar{X} = 16.55$  in the notes to  $\bar{X} = 66.55$  during consecutive delivery or 4.02 times the amount. Adverbs rose from  $\bar{X} = 6.55$  to  $\bar{X} = 12.00$  or 1.83 times. Pronouns rose from  $\bar{X} = 1.00$  to  $\bar{X} = 16.89$  or 16 times. Digits rose slightly from  $\bar{X} = 11.67$  in the notes to  $\bar{X} = 12.33$  during consecutive delivery or 1.06 times. Finally, verbs rose from an average of  $\bar{X} = 10.67$  in the notes to  $\bar{X} = 47.78$  during consecutive delivery, that is 4.48 times. There were no articles whatsoever recorded in the notes but during consecutive delivery, a mean of  $\bar{X} = 37.89$  articles were present.

Several events take place between the note-taking phase and consecutive delivery. The interpreter, by way of notes, is able to reconstruct the entire original version (what happens

between Input and Consecutive delivery or Step A' will be examined at a later stage).

The first event which takes place between note-taking and consecutive delivery is simply one of replacement. In this case, there is enough information in the notes for the subject to reproduce the original version although the input was in L<sub>1</sub>, the notes in L<sub>2</sub> and the consecutive delivery in L<sub>2</sub>.

For example:

<u>Notes</u>	<u>Consecutive delivery</u>
ch <sup>CS</sup> = rte mode	These motorways had characteristics similar to modern motorways.

Replacement may involve nouns:

For example:

<u>Notes</u>	<u>Consecutive delivery</u>
+ <u>bushes</u> central	... and on planting bushes in the central <u>area</u> ...

Most often replacements include verbs:

For example:

<u>Notes</u>	<u>Consecutive delivery</u>
shrubs in middle	People <u>have</u> also <u>started</u> <u>planting</u> shrubs in the central reservations

According to the table on page 255, the highest number of replacements were the articles (from  $\bar{X} = 0$  in the notes to  $\bar{X} = 37.89$  in consecutive delivery). For example:

<u>Notes</u>	<u>Consecutive delivery</u>
& D → 1st route	... <u>the</u> German government built <u>the</u> first motorway...

Following articles, the next item to be replaced most frequently was the pronoun (from  $\bar{X} = 1.00$  in the notes to  $\bar{X} = 16.89$  during consecutive delivery). For example:

<u>Notes</u>	<u>Consecutive delivery</u>
→ p <sup>se</sup> + strates	..... <u>They</u> did <u>this</u> for strategic reasons...

Step B: What happens between the Note-taking phase and Consecutive delivery?

	<u>Notes</u>	<u>Consecutive delivery</u>
Meaning units:	$\bar{X} = 66.94$	$\bar{X} = 77.42$
Number of words:	$\bar{X} = 175.11$	$\bar{X} = 427.78$
Nouns:	$\bar{X} = 67.89$	$\bar{X} = 110.67$
Adjectives:	$\bar{X} = 23.89$	$\bar{X} = 35.33$
Prepositions:	$\bar{X} = 16.55$	$\bar{X} = 66.55$
Adverbs:	$\bar{X} = 6.55$	$\bar{X} = 12.00$
Pronouns:	$\bar{X} = 1.00$	$\bar{X} = 16.89$
Digits:	$\bar{X} = 11.67$	$\bar{X} = 12.33$
Verbs:	$\bar{X} = 10.67$	$\bar{X} = 47.78$
Articles:	$\bar{X} = 0$	$\bar{X} = 37.89$

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Step B: What happens between Note-taking and Consecutive Delivery?

After the nouns came the verb (see former example) with an average of  $\bar{X} = 10.67$  in the notes and  $\bar{X} = 47.78$  for consecutive delivery, an increase by a factor of 4.48.

Following the verb, the item most frequently replaced during consecutive delivery was the preposition ( $\bar{X} = 16.55$  in the notes to  $\bar{X} = 66.55$  in consecutive delivery, that is an increase by a factor of 4.02). For example,

<u>Notes</u>	<u>Consecutive delivery</u>
econ crisis	So we can see that <u>in</u> the middle of an economic crisis...

After the preposition, the largest increase recorded was simply the number of words used during consecutive delivery. Whereas the number of items present in the notes averaged out to  $\bar{X} = 175.11$ , the number of words used to reconstruct these notes increased to  $\bar{X} = 427.78$ , an average even superior to the mean number of words presented to the subjects in the original texts ( $\bar{X} = 423$ ), bearing in mind that the ideal comparison is not with the number of words in the original ( $L_1$ ) but the number of words in an ideal translation of the input ( $L_2$ ).

Interestingly, the high number of words used during consecutive delivery did not mean that the quality would necessarily follow: although there were  $\bar{X} = 90.33$  meaning units presented by way of  $\bar{X} = 423$  words, only  $\bar{X} = 77.42$  meaning units reappeared during consecutive delivery in spite of a mean of  $\bar{X} = 427.78$  words.

The second event which occurs during consecutive delivery is reconstruction. Since an interpreter is physically unable to make note of every single item presented to him during the input stage, he is obliged to retain only what seems to be essential and discards the rest. From the skeleton of notes he does retain, there is a reconstruction process which takes place during consecutive delivery.

The best example to illustrate such a reconstruction process is one where six out of six subjects reconstructed in the very same manner.

The French input phrase was the following:

"... et l'on fait des plantations d'arbustes sur les terre-pleins central pour que les conducteurs ne soient pas éblouis par les phares des voitures arrivant en face".

The English equivalent would approximate the following:

"... and shrubs are being planted in the central reservations so that drivers will not be blinded by the headlights of oncoming traffic".

The notes of the six subjects were:

Subject A: shrubs in middle so not blinded. ○ ○

Subject B: + bushes so no dazzle  
          central

Subject C: trees ⊙ so driver = X dazzled

Subject D: central divns - bushes to ↓ ébloui lights opp

Subject E: planting trees in central reser no dazzle

Subject F: + trees in middle to avoid dazzle

and their respective subsequent consecutive deliveries:

Subject A: People have also started planting shrubs in the central reservations so that the traveller will not be blinded by the lights of oncoming cars.

Subject B: ... and on planting bushes for example in the central area so that motorists are not dazzled by the headlights of cars going in the other direction.

Subject C: Trees are being planted in the centre so that drivers aren't dazzled by oncoming traffic.

Subject D: ... and small hedges are being built down the centre of motorways to prevent car-drivers being dazzled by oncoming headlights in the opposite direction.

Subject E: ... the planting of trees, shrubs, in the central reservation, in order to avoid dazzling from vehicles coming in the opposite direction.

Subject F: ... and bushes are being planted in the central reserve in order to avoid dazzle.

This example was chosen to illustrate which particular items were considered more important for the subject-interpretor to make note of. Every subject, with the possible exception of subject D, felt it was unnecessary to note that the dazzle would be coming from the headlights of oncoming traffic. "From oncoming traffic" becomes almost redundant when coupled with the noun 'dazzle': where else could the dazzle come from? Subjects felt it was more important to make a note of the shrubs that were being planted in the central reservations, although here again, few subjects found it necessary to indicate in their notes that the shrubs were actually being planted (another redundancy) but subjects all make note of the type of planting involved, where it was being planted and its main purpose: that of eliminating the dazzle. Five of the six subjects made no reference to the fact that the lights would be coming from oncoming traffic, either because they felt that they would be able to remember the clause during consecutive delivery or because they thought that items in their notes, such as 'dazzle' or 'ébloui' (input) would automatically trigger the end of the clause during consecutive delivery, that is, the lights coming from the opposite direction.

The 'reconstructive' aspect of consecutive delivery is well illustrated by this example. Note the few number of items used by the subjects in their notes ( $\bar{X} = 6.66$ ) against the reconstructed delivery which contained an average of  $\bar{X} = 20.83$  words.

Another event which occurs during consecutive delivery is that of addition. Barik (1975) referred to additions as items not to be found in the original, which were added by the subject (exclusive of repetitions, false starts, etc) and of new material introduced in conjunction with a substitution or error of

translation. He went on to specify four types of additions:

- . a qualifier addition or the addition by the subject of a qualifier or short qualifying phrase not in the original version;
- . an elaboration addition similar to the qualifier addition, but more elaborate and more extraneous to the text;
- . a relationship addition or the addition of a connective or of other material which introduces a relationship among sentence units not specified in the original;
- . a closure addition or addition which accompanies rephrasing omission or misinterpretation on the part of the subject and which serves to give 'closure' to a sentence unit but does not add anything substantial to the sentence. (See Barik, 1975, pages 6 and 7).

The present study bases itself on Barik's classification up to a certain point. For example this study did not include any new material introduced in conjunction with a substitution or error of translation: these aspects will be examined separately. Examples for the four types of additions include the following:

- . qualifier additions where subjects introduced a qualifier which was not present in the original version. For example:

<u>French input</u>	<u>English version</u>
"... pour donner du pain à tous les sans-travail de l'après-guerre"	"... in order to feed the unemployed after the war".

Notes

-t<sup>o</sup> > war

Consecutive delivery

"... after the first World War".

- . elaboration additions which were simple extensions of a qualifier addition only more elaborate and more extraneous.

<u>French input</u>	<u>English version</u>
"... pour donner du pain à tous les sans-travail de l'après-guerre"	"... in order to feed the unemployed after the war".



Notes

post war starvers

Consecutive delivery

"... to provide jobs and therefore food to the thousands of people who were left starving after the war".

. relationship additions which imply the addition of a connective of some form or other which were not present in the original. For example:

French input

"En pleine crise économique, l'Allemagne avait prévu le fantastique essor de l'automobile. Hitler n'eût qu'à appliquer les plans existants".

English version

"In the middle of an economic crisis, Germany had foreseen the emergence of the automobile. All Hitler had to do was implement the already existing plans".

Notes

in  $\Sigma$  crise  
D  $\leftarrow$   $\nearrow$  car  
apply exist. plans

Consecutive delivery

"At a time of great economic crisis, the Germans foresaw the supremacy, as it were, of the car. They saw that the car would reign supreme in Europe, and they therefore just had to apply the existing plans".

. closure additions or additions which accompany rephrasing, omission or misinterpretation on the part of the interpreter and which serve to give 'closure' to a sentence unit without adding anything of substance to the sentence. For example:

French input

"En même temps, les ingénieurs mettaient au point les plans du grand axe Hambourg-Bâle dont les premiers tronçons viennent d'être terminés près de 40 ans plus tard".

English version

"At the same time, engineers were finalizing the plans for the great link road between Hamburg and Basel whose first segments have just been completed some 40 years later".

Notes

same time  
ing<sup>o</sup> → plans  
tronçons \ 40 y later

Consecutive delivery

"At the same time, engineers developed plans which still bore fruit 40 years later".

One input text, "The Motorway", yielded 12 types of additions as recorded in three subjects' notes. Two were qualifier additions, seven were elaboration additions, two were relationship additions and one was a closure addition.

The next event to take place between the note-taking phase and consecutive delivery was omission. As described and defined earlier for Step A (what happens between input and note-taking phase), there were 7 omissions recorded in Step B, that is between the note-taking phase and consecutive delivery.

. skipping omissions which meant the omission of a single lexical item such as a qualifier or a short phrase which was present in the subjects' notes but which did not reappear in the consecutive delivery although its absence did not alter the meaning of the original to any great extent. For example:

Notes

+ large signs  
x<sup>1</sup> / obstacles  
(lamps)

Consecutive delivery

"... including the addition of large signs and the removal of all obstacles".

. comprehension omissions which meant the omission of a larger unit of items than in the skipping omission or of a more pertinent item, due to the inability on the subject's part to understand either the source material or the item present in the notes.

The result also reflected a loss of meaning in the delivery. For example:

Notes

→ p<sup>se</sup>  
+ stratés

Consecutive delivery

"They did this for reasons of prestige as well as for economic reasons".

(The input in English had been: "Hitler pushed these plans energetically"),

. compounding omissions were the result of a subject compounding or regrouping several clauses in his notes, reflecting a change of meaning in the consecutive delivery. For example:

Notes

plan Hamburg-Bâle

link

40 yrs. later

Consecutive delivery

"They also laid down the plan for the big Hamburg-Basel link road which was not completed until quite some time later".

. total omissions refer to any item which was present in the notes and which did not reappear in the consecutive delivery.

For example:

Notes

I<sup>st</sup>

routier

✓ (sans sec)

live conf. sans auto

Consecutive delivery

"... industrialists and lorry drivers can live comfortably without leaving the motorways".

The final event which takes place between the note-taking phase and consecutive delivery is error.

There were only two instances of "errors" between the note-taking phase and consecutive delivery since most errors are committed during Step A, that is between input and note-taking. Several examples will be provided nevertheless to show that the symbol employed by the subject during note-taking, although not necessarily 'incorrect', was nevertheless poorly chosen since it failed to provide the subject with a precise translation of the original material.

Example 1):

<u>French input</u>	<u>English version</u>
"Quant à l'escalade, l'opinion générale est que la marijuana n'est pas plus nocive que l'alcool".	"With regards to escalation (or 'going on to harder drugs'), the general opinion is that marijuana is no more harmful than alcohol".

Notes  
as for ↗  
gen opn  
mari

Consecutive delivery

"As for the general opinion, which is very widespread, this maintains that the use of marijuana..."

What happened in this case was that the subject used the symbol of the arrow to represent 'l'escalade', which was correct. Only upon re-reading her notes during consecutive delivery, she mistook the arrow as belonging to the 'general opinion' clause.

Example 2):

<u>French input</u>	<u>English version</u>
"La population mondiale s'accroît par suite d'un mouvement naturel".	"World population increases as a result of a natural movement".

Notes  
⊖ pop ↗ foll  
nat<sup>l</sup> mvmt

Consecutive delivery

"The world population grows according to national movement".

Here again, the notes looked correct, although interpreters are encouraged to avoid using too many abbreviations since they can easily be misread during consecutive delivery, as shown in the above example, where 'natural' and 'national' were confused.

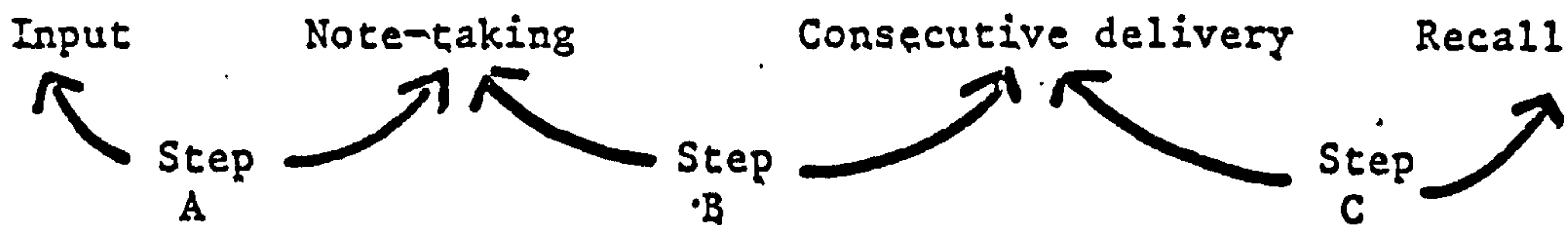
To recapitulate what occurs between the consecutive note-taking phase, where  $\bar{X} = 66.94$  (or 73%) meaning units are represented, and the consecutive delivery phase, where  $\bar{X} = 77.42$  (or 86%) of the meaning units are present, subjects tended to replace items that had been omitted intentionally during the note-taking phase: nouns went up 1.63 times; adjectives went up 1.48 times; prepositions increased 4.02 times; adverbs, 1.83 times; pronouns, 16 times. digits, 1.06 times and verbs also increased by a factor of 4.48 times.

The other phenomenon which occurred frequently during this phase was that of reconstruction: from a relatively limited number of items in a subject's notes ( $\bar{X} = 6.66$ ), reconstructions in the consecutive delivery contained an average of  $\bar{X} = 20.83$  words.

Finally, additions made up the final category of events to occur between note-taking and consecutive delivery with qualifier additions, elaboration additions, relationship additions and closure additions. The most frequent addition was the elaboration addition ( $n = 7$ ) followed by qualifier additions ( $n = 2$ ) and by relationship additions ( $n = 2$ ) and lastly by closure additions ( $n = 1$ ).

---

Step C: What happens between Consecutive delivery and Recall?



To recapitulate some of the results obtained in the former steps, in Step A (what occurs between input and note-taking stage), it was found that 73% of the original input material was recorded in the interpreter-subjects' notes.

In Step B (what occurs between the note-taking phase and consecutive delivery), results indicated that more material was delivered orally than had been presented in the notes, in fact 12% more.

In Step C (what occurs between consecutive delivery and recall), the number of meaning units recalled by the subject drops by 33% compared to the meaning units delivered during consecutive.

A closer examination of the items which 'disappear' during Step C (See page 268 ) indicate that:

- . the total number of words drops from  $\bar{X} = 427.78$  to  $\bar{X} = 316$ ;
- . the total number of meaning units recalled by the subjects drops from  $\bar{X} = 77.42$  during consecutive delivery to  $\bar{X} = 46.92$  during recall;
- . the number of nouns drops from  $\bar{X} = 110.67$  to  $\bar{X} = 72.89$ ;
- . the number of adjectives drops from  $\bar{X} = 35.33$  to  $\bar{X} = 26.11$ ;
- . the number of prepositions drops from  $\bar{X} = 66.55$  to  $\bar{X} = 48.11$ ;
- . the number of adverbs drops from  $\bar{X} = 12.00$  to  $\bar{X} = 7.33$ ;
- . the number of pronouns increases from  $\bar{X} = 16.89$  to  $\bar{X} = 17.55$ ;
- . the number of digits drops from  $\bar{X} = 12.33$  to  $\bar{X} = 9.44$ ;
- . the number of verbs also decreases from  $\bar{X} = 47.78$  to  $\bar{X} = 37.67$ ;
- . the number of articles drops from  $\bar{X} = 37.89$  to  $\bar{X} = 23.78$ .

Step C: What happens between Consecutive delivery and recall?

	<u>Consecutive delivery</u>	<u>Recall</u>
Number of words:	$\bar{X} = 427.78$	$\bar{X} = 316.00$
Meaning units:	$\bar{X} = 77.42$	$\bar{X} = 46.92$
Nouns:	$\bar{X} = 110.67$	$\bar{X} = 72.89$
Adjectives:	$\bar{X} = 35.33$	$\bar{X} = 26.11$
Prepositions:	$\bar{X} = 66.55$	$\bar{X} = 48.11$
Adverbs:	$\bar{X} = 12.00$	$\bar{X} = 7.33$
Pronouns:	$\bar{X} = 16.89$	$\bar{X} = 17.56$
Digits:	$\bar{X} = 12.33$	$\bar{X} = 9.44$
Verbs:	$\bar{X} = 47.78$	$\bar{X} = 37.67$
Articles:	$\bar{X} = 37.89$	$\bar{X} = 23.79$

Table IV - 7

Step C: What happens between Consecutive Delivery and Recall?

Interpreters are normally asked to interpret a speech from  $L_2$  into  $L_1$ : the interpretation may be simultaneous or consecutive. But once these tasks have been performed, interpreters are never required to recall any of the information presented during the speech. In other words, interpreters are trained to listen and speak simultaneously during simultaneous interpretation and to make notes concurrently with a speech and then deliver the same speech in another language by way of the notes. But interpreters are not expected nor trained to recall any information beyond this stage. Bearing this in mind, the fact that the interpreter-subjects were only able to recall 52% of the original input speech was no surprise.

Following a word count, a closer analysis of the events that occurred between consecutive delivery and recall was undertaken by comparing the number and type of departures between the two tasks.

To construct a coding method, the consecutive delivery and the recall of six subjects were recorded on magnetic tape concurrently with their delivery. Subsequently, the recordings were transcribed for further analyses. All events judged to represent departures from the original were noted and coded according to the coding scheme presented below:

1. Omissions:

Omissions refer to items which were present in the French original and which were omitted or no longer present in the subject's recall protocol. Three main types of events fall under the heading of 'omissions':

a) a skipping omission as defined by Barik (1975), a skipping omission involved a single word or short phrase, generally referring to a qualifying adjective left out of the subject's recall. This type of omission did not alter the grammatical



structure of the sentence and resulted in very little loss of meaning. For example:

<u>French version</u>	<u>English version</u>
"En pleine crise économique l'Allemagne avait prévu le fantastique essor de l'automobile".	"In the middle of an economic crisis, Germany had foreseen the fantastic automobile boom".

Subject's recall:

"In the middle of an economic crisis, Germany had foreseen the (omission) automobile boom".

b) a clause omission was an omission which was considered more serious than the previous skipping omission in that the entire clause had been omitted by the subject, either intentionally, due to the redundancy of the clause itself, for example,

<u>French version</u>	<u>English version</u>
"... glissières de sécurité, pour empêcher les voitures de sortir de la chaussée".	"... crash barriers, to prevent cars from going off the road".

Subject's recall:

"... crash barriers..."

or if it was a case of an 'accidental' omission. In either case it appeared that the subject did not or was unable to recall a clause, although it had appeared in the original. Such an omission, although more heavily penalized than a mere 'skipping omission' did not break the thread of the text nor did it produce disjointed speech. For example:

<u>French version</u>	<u>English version</u>
"... les industriels peuvent sans perdre une seconde, vivre confortablement sans quitter l'autoroute".	"... industrialists can, <u>without wasting one second</u> , live comfortably without leaving the motorway".

Subject's recall:

"... industrialists can live comfortably (omission) without leaving the motorway".

c) a phrase omission was considered the most serious offence since it involved more omitted material, such as an entire phrase or sentence. Again, subjectively speaking, there were several possible explanations for such omissions. In the note-taking phase, this type of omission could have been what Barik labelled a "delay omission" (Barik, 1975), although he used the term when referring to simultaneous interpretation. A delay omission can occur during note-taking when, for example, the subject is searching for the English translation of the French "bornes kilométriques" (milestones) and is therefore unable to register or process any information beyond the word itself. This lag may force the subject to wait for the beginning of a new sentence or unit of meaning and he may by-pass some fresh information simply in order to 'catch up'.

Phrase omissions can also be due to a phrase or sentence that was consistently omitted by several subjects, again, either due to redundancy in the original, for example:

<u>French version</u>	<u>English version</u>
"Ainsi, jour après jour, l'autoroute devient de plus en plus rapide, de plus en plus sûre, de moins en moins fatigante".	"Thus, day by day, the motorway is becoming more rapid, more safe and less tiring".

Subject' s recall:

(This sentence was entirely omitted during recall), or to the fact that it did not seem to be of major importance to the overall continuity of the story as it sounded like a summary or a conclusion to the passage.

2. Additions:

This category refers to material which was added to the text by the subject. New material introduced by the subject on account of an error of translation, even though it represented something which was not present in the original, was not considered as an

addition but falls instead under the heading of 'semantic error', which will be discussed at a later stage. Repetitions and false starts on the part of the interpreter-subjects were not considered as additions to the text. Five types of events constituting additions were specified:

a) a qualifier addition, that is the addition of a qualifier or qualifying phrase not present in the original version. For example:

<u>French version</u>	<u>English version</u>
"... l'Allemagne avait prévu..."	"... Germany had foreseen..."

Subject's recall:

"... Germany had shown great (addition) vision..."

In this instance, the interpreter either wanted to emphasize his statement or invert the emphasis since the rest of the sentence went like this: "Germany had foreseen the great emergence of the automobile". Note, however, that there was no alteration in the meaning of the sentence.

b) an elaboration addition which was an addition in the form of an elaboration or other straight addition to the text. For example:

<u>French version</u>	<u>English version</u>
"... pour donner du pain à tous les sans-travail de l'après-guerre".	"... in order to feed all the post-war unemployed".

Subject's recall:

"... in an attempt to provide work and therefore food to the thousands of people who had been left starving by the first World War".

In this case, the interpreter-subject was elaborating what the original version had presented. Although the elaboration may appear extraneous, the subject was simply explaining the French idiom 'donner du pain à' (literally: 'to give bread to') but the English 'bread' having two meaning (bread and money) may explain why the subject felt the need to elaborate.

c) a filler addition consisted of extraneous material which neither altered the general gist of the input material nor offered any valid explanation. Subjectively speaking, filler additions were often used by subjects who had less material to recall and tried to compensate for this by adding fillers as 'as it were' or 'for all intents and purposes'. Such filler additions may also buy some extra time for subjects who are either trying to come up with the ideal translation of an item or who are unable to read their notes. For example:

<u>French version</u>	<u>English version</u>
"Leurs caractéristiques étaient déjà celles des autoroutes modernes".	"Their characteristics were already those of modern motorways".

Subject's recall:

"And the motorways that existed at that time were to all intents and purposes the same as the motorways of the modern day".

d) an inference addition consisted in adding a statement which did not alter the meaning of the passage (which would have then been labelled as a 'semantic error') but which nevertheless was not present in the original text. For example:

<u>French version</u>	<u>English version</u>
"Depuis, dans tous les pays, les ingénieurs ont introduit d'importantes modifications de détail".	" Since then, in all countries, engineers have introduced important changes in detail".

Subject's recall:

"Since then, in all countries, engineers have made important modifications for safety".

e) a closure addition was an addition which accompanied rephrasing, omission or misinterpretation on the part of the interpreter-subject and which served to give 'closure' to a sentence unit. It also included what Bartlett (1932) referred to when he mentioned

that subjects transformed certain elements which were poorly understood into more familiar structures.

The following example was observed in three out of six subjects and needs some explaining. The French version said: "Hitler n'eût qu'à appliquer les plans existants". There had been no previous mention made of Hitler in the text and the French pronunciation of the name "Hitler", with an emphasis on the second syllable, caused one subject to note "Mr. Eclair" upon hearing "Hitler" pronounced in French.

French version

Hitler n'eût qu'à appliquer  
les plans existants.

English version

All Hitler had to do was put the  
existing plans into effect.

Subject's recall

So all they had to do (the Germans), was to apply their plans which already existed.

3) change of order. Change of order could occur in two manners. Either the subject would recall all the material that he could possibly remember and suddenly add a statement at the last minute, such as a proposition that had been omitted at the beginning of the passage, for example:

Subject's recall:

"I forgot to say that in Germany, at a time of economic crisis, Germany had shown great vision in recognizing the future emergence of the car",

or, the subject would recall a list of items and inverse the order of said items. In the text entitled "The Motorway" (L'Auto-route), there was a list of modifications which had been undertaken by engineers all over the world: crash barriers, large signposts and removal of obstacles. Subjects would often change the order when recalling such lists and were apparently unaware of such changes of order.

For example:

Subject's recall:

"But their motorways had all the characteristics of today's motorways: they were one-way; they had no black spots and I think that they had large sign posts - I think that came later".

4) Semantic errors: semantic errors were considered the most serious kind of departure from the original French version. This category included material substituted by the subject involving either a single word or an entire clause. Whereas some substitutions hardly affected the meaning of the passage, others considerably altered it, thus constituting an error of translation. Two types of semantic errors fell into this category:

a) a mild semantic error or error or inaccuracy of translation of some lexical item which only slightly distorted the original meaning. In several instances, the error was associated with an awkward translation. For example:

<u>French input</u>	<u>English version</u>
"En Europe, l'autoroute est née du chômage".	"In Europe, the motorway was born as a result of unemployment".

Subject's recall:

"Motorways originally developed as a response to unemployment".

In such instances, the inaccuracy was restricted to the lexical item or expression and did not affect the rest of the meaning unit.

b) a gross semantic error or error of translation of some lexical item which substantially changed the meaning intended by the original version. For example:

<u>French version</u>	<u>English version</u>
"On s'attache maintenant à supprimer les lignes droites pour éviter la monotonie des longs parcours".	"Efforts are being made to eliminate straight lines to avoid the monotony of long trips".

Subject's recall:

"... the suppression of continuous or discontinuous white lines in the middle of the motorway".

5) Summarization occurred quite frequently during recall especially in cases when subjects knew there was a list of items or points to be recalled and opted to summarize rather than attempt an itemization. For example:

French input

"Depuis, dans tous les pays, les ingénieurs ont introduit d'importantes modifications de détail: glissières de sécurité pour empêcher les voitures de sortir de la chaussée; signalisations géantes; éloignement de tous les obstacles, en particulier les lampadaires, les piles de pont et les bornes kilométriques".

English version

"Since then, in all countries, engineers have introduced important detail modifications: crash barriers so that automobiles do not run off the road; large signposts; distancing obstacles as much as possible, particularly lamp-posts, bridge piers and milestones."

Subject's recall:

"Since this time, engineers in all countries have made somewhat detailed changes to motorways in order to improve their safety, to make them a quicker means of transport".

It is difficult to judge whether this type of summarized recall should be labelled as such or whether it should fall under the heading of 'omissions' since the subject did not provide a single example from the list of items. The fact that there was a mention made about 'safety' implies that the subject had somehow retained the main purpose of the changes and modifications undertaken by the engineers. In such cases, I subjectively chose to label this as a 'summarization' as opposed to a straightforward 'omission'.

6) Faulty links: Faulty links are considered as a serious error in and among interpreters. Most interpreters-in-training are encouraged to leave a wide margin at the left-hand side of the page in order to insert the links necessary to reconstruct the

vital transitions between propositions, such as "but", "because", "therefore", "since", "however," etc. Often, the link may be faulty as in the example provided below although the remainder of the proposition may be virtually intact: this was the criterion upon which the difference between "faulty links" and "semantic error" was based.

<u>French input</u>	<u>English version</u>
"En même temps, les ingénieurs mettaient au point les plans du grand axe Hambourg-Bâle..."	"At the same time, engineers were finalizing the plans for the great Hamburg-Basel axis..."

Subject's recall

"Subsequently, a large link road was planned between Hamburg and Basel..."

Given the previous coding method, the protocols of six subjects were analyzed and the following events occurred during recall.

- 1) Elaboration headed the list with 12 elaborations out of a total of 68 possible departures recorded among six subjects' recall protocols, thus representing 18% of possible departures.
- 2) Skipping omissions came next with a total of 10 such omissions recorded or 15% of all possible departures.
- 3) Clause omissions and phrase omissions came next, both found in 8 instances or 12% of departures.
- 4) Inference addition and closure addition came next with 6 instances or 9% of possible departures from the original text.
- 5) Qualifier additions followed with 5 cases or 7% of possible departures.
- 6) Summarization accounted for 6% of departures in 4 instances.
- 7) Change of order and semantic error accounted for only 4% of possible departures with only 3 instances of each.
- 8) Faulty links with 2 instances accounted for 3% of all possible departures from the original.
- 9) Filler additions were found in only one instance, that is 1%



of all possible departures.

As can be seen in the above-mentioned figures, there appears to be more elaboration during recall than omissions. However, since an omission was penalized in the same fashion as an elaboration, the figures could be misleading. For instance, a subject may have elaborated by adding the three words "as it were" thereby being recorded as having made one (1) filler addition, and not three (3), one for each added word. When omitting an item or an entire sentence, again, the subject was penalized once only and not for the fifteen or twenty items omitted in an entire sentence. It is the nature of the event that occurs during recall that is being tabulated here and not a word count.

Skipping omissions appear to be the most frequent type of omission, closely followed by both clause and entire phrase omissions.

The most serious departure from the original, the 'semantic error' was not as frequent as expected. This could be due to the fact that during consecutive interpretation, contrary to simultaneous interpretation, the subject hears the entire speech before being asked to translate it, thus giving him time to search for a word and also providing him with the conclusion of the passage he is asked to interpret.

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Step A'; What happens between Input and Consecutive delivery?



To summarize the results obtained in the previous sections, Step A, that is the process of taking notes concurrently with a speech, showed how subjects made notes of 73% of the original input information. Step B, or the process of delivering an oral reconstruction of the original speech by way of notes, showed how subjects were able to render 85% of the input material.

This section, Step A' will examine what events occur between the input phase and consecutive delivery without taking into consideration the role played by the notes.

Results on p. 280 show that there were just as many words involved in both the French input and the English consecutive delivery,  $\bar{X} = 423$  and  $\bar{X} = 427.78$ , respectively. However, the quantity did not necessarily mean quality since only  $\bar{X} = 77.42$  meaning units were retained during consecutive delivery which represents 85% of the original meaning units ( $\bar{X} = 90.33$ ).

Among other items, more nouns were used during consecutive delivery ( $\bar{X} = 110.67$ ) than were in the original message ( $\bar{X} = 101.67$ ). On the other hand, fewer adjectives were used during consecutive delivery ( $\bar{X} = 35.33$ ) than in the input ( $\bar{X} = 40.67$ ); fewer prepositions were used ( $\bar{X} = 76.67$  and  $\bar{X} = 66.55$ , respectively); fewer adverbs ( $\bar{X} = 17.33$  and  $\bar{X} = 12.00$ ); fewer pronouns ( $\bar{X} = 23.33$  and  $\bar{X} = 16.89$ ); the same amount of digits appeared in both the input material and in the consecutive delivery protocols ( $\bar{X} = 12.00$  and  $\bar{X} = 12.33$ , respectively); interestingly, more verbs were used during consecutive delivery than were present in the original text ( $\bar{X} = 47.78$  and  $\bar{X} = 38.67$ ) which follows the

A': What happens between Input and Consecutive delivery?

	<u>Input</u>	<u>Consecutive delivery</u>
Number of words:	$\bar{X} = 423$	$\bar{X} = 427.78$
Meaning units:	$\bar{X} = 90.33$	$\bar{X} = 77.42$
Nouns:	$\bar{X} = 101.67$	$\bar{X} = 110.67$
Adjectives:	$\bar{X} = 40.67$	$\bar{X} = 35.33$
Prepositions:	$\bar{X} = 76.67$	$\bar{X} = 66.55$
Adverbs:	$\bar{X} = 17.33$	$\bar{X} = 12.00$
Pronouns:	$\bar{X} = 23.33$	$\bar{X} = 16.89$
Digits:	$\bar{X} = 12.00$	$\bar{X} = 12.33$
Verbs:	$\bar{X} = 38.67$	$\bar{X} = 47.78$
Articles:	$\bar{X} = 56.67$	$\bar{X} = 37.89$

Table IV - 8

Step A': What happens between Input and Consecutive Delivery?

trend found in the usage of nouns. Finally, there were fewer articles used in consecutive delivery ( $\bar{X} = 37.89$ ) than those present in the original input text ( $\bar{X} = 56.67$ ).

Judging by these figures, it appears as though the consecutive delivery of a given text retains approximately 85% of the original information, although just as many words were used in both cases. A closer examination reveals that more verbs and nouns are used during the consecutive delivery, but fewer adjectives, adverbs, pronouns, prepositions and articles.

How can this 15% loss of meaning units be explained in spite of the fact that the same number of words were used? By comparing the meaning units in the original material to those obtained during consecutive delivery, by-passing, as it were, the note-taking phase altogether, several possible explanations came to light.

. omission: omission is the simplest and most obvious explanation for any loss of information between input and output. Several types of events fall under this heading. For example, there is the:

. skipping omission which is an omission of a lexical item which does not result in any loss of meaning. It is not always clear whether this omission occurred because the interpreter did not have time to make note of it during the note-taking phase due to the speed of the input, in which case the term of 'delay omission' would be more appropriate (Barik, 1975) or whether the interpreter did not know the English term for the stimulus item, in which case he either skips it altogether ('skipping omission') or writes the term down in the source language, hoping that the English term will come to his mind before he begins the consecutive delivery. Furthermore, it is not clear whether an item is omitted because the interpreter thinks he will recall it at the time of delivery since the item belongs to a long series of similar items,

but then forgets to mention it during consecutive delivery. Examples are provided for all the above-mentioned explanations.

French input

English version

"... éloignement de tous les obstacles, en particulier les lampadaires, des piles de pont, des bornes kilométriques".

"... distancing all obstacles, especially lamp-posts, bridge-piers and milestones".

Notes (Subject A)

all obsts out.

lamps etc. milestones

Consecutive delivery (Subject A)

"... and also the suppression of all possible obstacles such as lamp-posts, milestones, etc".

In this case, subject A made no note of 'piles de pont' either due to a delay omission or to a simple skipping omission, but most likely, the subject simply did not know what the English for 'piles de pont' was.

Notes (Subject B)

X<sup>1</sup> / obstacles  
(lamps)

Consecutive delivery (Subject B)

"... and the removal of all obstacles".

This is a straightforward case of a skipping omission since the item '(lamps)' was present in the notes, there should have been at least one item mentioned. In such cases, not only is an omission taking place but also a summarization since the subject labelled all items to be removed as mere 'obstacles'.

Notes (Subject C)

X obstacles near

lamps km mon piles ----

Consecutive delivery (Subject C)

"... and there are no obstacles nearby, such as road lamps, or milestones and fire-hydrants".

This represents a good example of what an interpreter does when he cannot find the immediate cognate in his mother-tongue: he writes down the item in the source language, either phonetically or in its entirety, hoping to come up with the ideal translation before beginning his consecutive delivery. In this instance, Subject C was unable to do so but provided an intelligent substitute: the fire-hydrant. This example should not be considered as pertaining to the omission section but rather as an error.

The final example to illustrate an intentional skipping omission, one where the subject thinks he will be able to recall an item because it is one of a series, comes from a different text, entitled "Demographics".

<u>French input</u>	<u>English version</u>
"On a calculé que tous les désastres: massacres des guerres, tremblements de terre, inondations, épidémies, enregistrés depuis 1850 n'ont représenté qu'un retard d'une dizaine d'années dans la croissance".	"It has been calculated that all disasters: war massacres, earth-quakes, floods, plagues, recorded since 1850 have only represented a delay of about ten years in growth".

Subject's notes

calc: all disaster

massacres

epidemics

since 1950

= 10 yrs delay only in ↗

Consecutive delivery

"It is calculated that all natural disasters such as massacres, sickness, famine, floods and epidemics since 1950 have only delayed the process by about ten years".

Here is an example of a list or series of items which are all more or less synonymous. The interpreter may intentionally omit listing all the different types of disasters presented in French: 1) war massacres; 2) earth quakes; 3) floods; 4) plagues, since the note 'disaster' should be sufficient to trigger the four

disasters in question. What the subject did in his consecutive delivery, however, was to omit the following:

- 1) that it was a war massacre;
- 2) he did not mention the earthquake both in his notes or in his consecutive delivery;

and added the following:

- 1) sickness
- 2) and famine.

Other types of omission include the compounding omission which is associated with the subjects' regrouping or compounding elements from different clauses resulting in a sentence with a meaning slightly different from the original although the gist is retained (Barik, 1975). Example of a compounding omission:

<u>French input</u>	<u>English version</u>
"En même temps, les ingénieurs mettaient au point les plans du grand axe Hambourg-Bâle dont les premiers tronçons viennent d'être terminés près de 40 ans plus tard".	"At the same time, engineers were finalizing the plans for the large Hamburg-Basel axis whose first segments have just been completed some forty years later".

Subject's notes

Also plan HAMBURG-BALE  
link 40 years later

Consecutive delivery

"At the same time, they also laid down the plan for the big Hamburg-Bâle link road which was not completed until quite some years later".

A more serious omission sometimes occurs when the interpreter is unable to comprehend let alone translate a larger unit of text than in the skipping omission and results in a definite change of meaning during consecutive delivery. This is known as a comprehension omission. For example:

French input

English version

"En même temps, les ingénieurs mettaient au point les plans du grand axe Hambourg-Bâle dont les premiers tronçons viennent d'être terminés près de 40 ans plus tard".

"At the same time, engineers were finalizing the plans for the large Hamburg-Basel axis whose first segments have just been completed some 40 years later".

Subject's notes

same time

ing° → plans

tronçons 40 y later

Consecutive delivery

"At the same time, engineers developed plans which still bore fruit 40 years later".

Another type of omission was a contraction omission which differed slightly from the ordinary skipping omission in that no specific lexical item had been omitted but was simply not vital to retain as well as avoiding a word-for-word translation. Example of a contraction omission:

French input

English version

"... le gouvernement allemand mettait en chantier la première route à circulation rapide".

"... the German government started construction of the first rapid circulation road..."

Subject's notes

& D

→ 1st route

Consecutive delivery

"... the German government built the first motorway".

Another frequent type of omission was an omission due to redundancy. Since all three subjects omitted the same clause in their consecutive delivery, it could well have been because the clause itself was superfluous. For example:



French input

English version

"... glissières de sécurité pour empêcher les voitures de sortir de la chaussée..." " ... crash barriers to prevent cars from going off the road"

Subject A's consecutive delivery

"... such as the introduction of safety hard shoulders..."

Subject B's consecutive delivery

"... including the addition of hard shoulders..."

Subject C's consecutive delivery

"... they've erected safety-barriers".

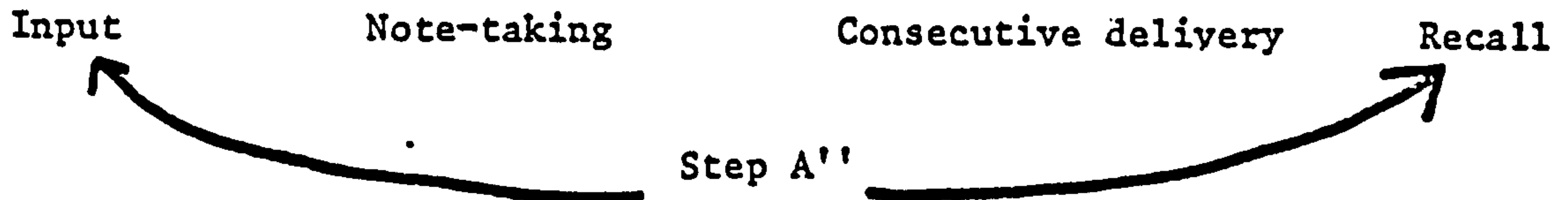
To recapitulate the events which occur between the input phase and consecutive delivery, it appears that subjects were just as wordy (Input:  $\bar{X}$  = 423 items) vs. (Consecutive delivery:  $\bar{X}$  = 427.78) although a similar quantity did not necessarily imply a similar quality since of the  $\bar{X}$  = 90.33 meaning units in the input, only  $\bar{X}$  = 77.42 were retained.

More nouns and verbs appeared in the consecutive delivery but there were fewer adverbs and adjectives.

The main reason for the 15% drop between the meaning units present during input and those retained during consecutive delivery seems to be due to skipping or delay omissions, summarization, compounding omissions, comprehension omissions, contraction omissions and finally, omissions due to redundancy.

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Step A'': What happens between Input and Recall?



Step A'' proposes to examine what happens between the very first phase or input stage when the interpreter listens to a text in  $L_2$ , and the final phase, when he is asked to recall verbally in  $L_1$ , i.e. his mother-tongue, as much as he can of the original passage. This section is not so much concerned with Steps A (what happens between the input and note-taking phases), B (what happens between note-taking and consecutive delivery) and C (what happens between consecutive delivery and recall) which have all been examined elsewhere and accounted for in previous sections but rather with Step A'', that is between the input and the final recall.

Results presented on page 288 show that the greatest loss in terms of meaning units occurs between input and recall: from a mean number of  $\bar{X} = 90.33$  meaning units processed by the interpreter during the input phase, only  $\bar{X} = 46.92$  are recalled in the final phase; this represents a loss of 48% of information.

The number of words used in the input phase was  $\bar{X} = 423$  compared to  $\bar{X} = 316$  words recalled. Among other items, nouns dropped from an average of  $\bar{X} = 101.67$  during input to  $\bar{X} = 72.89$  during recall; adjectives also dropped from  $\bar{X} = 40.67$  to  $\bar{X} = 26.11$ ; prepositions went down from  $\bar{X} = 76.67$  to  $\bar{X} = 48.11$ ; adverbs dropped from  $\bar{X} = 17.33$  to  $\bar{X} = 7.33$ ; pronouns dropped from  $\bar{X} = 23.33$  to  $\bar{X} = 17.56$ ; digits dropped slightly from  $\bar{X} = 12.00$  during input to  $\bar{X} = 9.44$  during recall; verbs, on the contrary, did not seem affected in any way since there were  $\bar{X} = 38.67$  at the input stage and  $\bar{X} = 37.67$  at the recall stage; finally, there were fewer articles during recall ( $\bar{X} = 23.78$ ) than at the input stage ( $\bar{X} = 56.67$ ).

Step A": What happens between Input and Recall1?

<u>Input</u>		<u>Recall1</u>
Number of words:	$\bar{X} = 423$	Number of words $\bar{X} = 316$
Meaning units:	$\bar{X} = 90.33$	Meaning units: $\bar{X} = 46.92$
Nouns:	$\bar{X} = 101.67$	Nouns: $\bar{X} = 72.89$
Adjectives:	$\bar{X} = 40.67$	Adjectives: $\bar{X} = 26.11$
Prepositions:	$\bar{X} = 76.67$	Prepositions: $\bar{X} = 48.11$
Adverbs:	$\bar{X} = 17.33$	Adverbs: $\bar{X} = 7.33$
Pronouns:	$\bar{X} = 23.33$	Pronouns: $\bar{X} = 17.56$
Digits:	$\bar{X} = 12.00$	Digits: $\bar{X} = 9.44$
Verbs:	$\bar{X} = 38.67$	Verbs: $\bar{X} = 37.67$
Articles:	$\bar{X} = 56.67$	Articles: $\bar{X} = 23.78$

Table IV -- 9

Step A": What happens between Input and Recall1?

Bearing in mind that interpreters are neither expected or trained to recall any of the original information once their task has been completed (be it simultaneous or consecutive interpretation), there are two ways of defining what does, in fact, happen between the input and the final recall: are we talking about a 48% loss of information or a gain of 52% ?

As presented in the previous section (Step C: What happens between Consecutive delivery and Recall), the events which occurred between Input and Recall included the following:

- 1) elaborations (18%)
- 2) skipping omissions (15%)
- 3) clause omissions (12%)
- 4) phrase omissions (12%)
- 5) inference additions (09%)
- 6) closure additions (09%)
- 7) qualifier additions (07%)
- 8) summarizations (06%)
- 9) change of order (04%)
- 10) semantic errors (04%)
- 11) faulty links (03%)
- 12) filler additions (01%)

Judging from the frequency counts of the propositions most often recalled by the six subjects (see page 291), and in chronological order, these were:

- 1) the fact that Hitler's strategy of building motorways turned against him during the invasion;
- 2) that one of the characteristics of modern motorways was the elimination of black spots;
- 3) that shrubs were planted in the central reservation in order to cut down the dazzle created by lights from oncoming traffic.

The three propositions presented above were recalled by all six subjects.

The following propositions were recalled by five out of six subjects:

- 1) the fact that motorways rose out of unemployment;
- 2) the fact that motorways could provide the unemployed with jobs;
- 3) the fact that another characteristic of modern motorways was that it was a dual carriageway;
- 4) the fact that engineers were trying to eliminate straight lines on motorways to avoid the monotony of long distance travel;
- 5) the fact that motorways were helpful and useful to those whose livelihood depended on travel;
- 6) and finally, the fact that, in Germany alone, there were some x number of relay-restaurants built.

To recapitulate the events which occur between input and recall, it appears that the greatest loss of information occurs at this stage, where  $\bar{X} = 90.33$  meaning units present in the input stage fall by 48% by the time recall occurs ( $\bar{X} = 46.92$ )

The number of words dropped by 26%. Nouns dropped by 29%. Adjectives dropped by 36%. Prepositions dropped by 38%. Adverbs dropped by 58%, pronouns by 25%, digits by 22%. Only the verbs remained constant, with only a 3% drop.

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Table IV - 10

<u>Recall</u>	<u>Frequency of recall</u>
Title: The motorway	50%
<u>Motorways came from unemployment</u>	83%
Germans were the first to build motorways in 1924	58%
(out of Berlin)	33%
<u>Motorways could provide the unemployed with jobs</u>	83%
Hamburg-Basel link started at the same time	67%
(segments finished only 40 years later)	42%
In full economic crisis, Germany had foreseen auto boom	25%
Hitler pushed plans for two reasons: prestige and strategy	67%
<u>Strategy turned against him during the invasion</u>	100%
(2,100 kilometers of autoroute left)	75%
Modern motorway characteristics:	67%
<u>dual carriageway</u>	83%
<u>no black spots</u>	100%
Engineers everywhere changing details:	67%
security ramps or crash barriers	67%
(so cars don't drive off road)	17%
huge signposts	67%
distancing obstacles	50%
(lamp-posts)	67%
(bridge piers)	0%
(milestones)	33%
<u>elimination of straight lines</u>	92%
(to avoid monotony)	83%
<u>shrubs planted in central reservation</u>	100%
(to cut down dazzle)	100%
(of oncoming traffic)	83%
Motorways are becoming faster, safer, less tiring	17%
Birth of new civilization	33%
Leisure - freedom - no queues upon return	67%

(continued.../)

<u>Work: motorways help business people</u>	83%
Life return to abandoned villages	50%
<u>In Germany, there are x number of relais-restaurants</u>	83%

---

Table IV - 11

Frequency count of recall  
of propositions

- 9 Shrubs planted in central reservations
- 8 to cut down the dazzle
- 8 dual carriage-ways
- 8 strategy turned against Hitler during the invasion
- 7.5 motorways could provide jobs to the unemployed
- 7 motorways came from unemployment
- 7 no black spots
- 7 elimination of straight lines
- 7 civilization of freedom - no queues
- 6.5 to avoid the monotony of long trips
- 6 Hamburg-Basel link road
- 6 Hitler pushed them for two reasons: prestige and strategy
- 6 motorways had characteristics of modern motorways
- 6 large signposts
- 6 motorways help business people
- 6 life returns to abandoned villages
- 6 in Germany, there are x number of relais-restaurants
- 5.5 the Germans were the first to build motorways in 1924
- 5.5 left 2,100 kilometers of motorway
- 5 crash barriers
- 4.5 segments only completed 40 years later
- 4 title: the motorway
- 4 built at the Berlin exit
- 4 engineers all over the world modifying details
- 4 removal of obstacles
- 4 lamp-posts
- 3 milestones
- 3 birth of new civilization
- 2 in full economic crisis, Germany had foreseen auto boom
- 2 so that automobiles cannot drive off the motorway
- 1 motorways are becoming safer, more rapid and less tiring
- 0 bridge piers

.....  
\_\_\_\_\_



Frequency of Recall of Propositions

	Consec notes KEPT	Consec notes REMOVED	Listen	Overall
Title: The Motorway	33%	67%	33%	44%
Motorways came from unemployment	67%	100%	67%	78%
Germans were the first to build motorways in 1924 (at the Berlin exit)	83%	33%	67%	61%
Motorways could provide the unemployed with jobs	33%	33%	67%	44%
Hamburg-Basel link started at the same time (segments completed 40 years later)	67%	100%	83%	83%
In full economic crisis, Germany had foreseen the automobile boom	33%	100%	67%	67%
Hitler pushed plans for two reasons: (prestige & strategy)	17%	67%	67%	50%
Strategy turned against him at invasion (2,100 kms of motorway left)	50%	0%	17%	22%
Modern motorway characteristics: dual carriageway no black spots	67%	67%	67%	67%
Engineers everywhere change details: security ramps or crash barriers ...	100%	100%	67%	89%
	100%	67%	100%	89%
	100%	100%	33%	78%
	83%	50%	0%	44%
	67%	67%	3%	56%

(continued on next page.../)

Frequency of Recall of Propositions (2)

	Consec notes KEPT	Consec notes REMOVED	Listen	Overall
. . . . (so that cars don't leave road)	0%	33%	33%	22%
huge signposts	67%	67%	67%	67%
distancing obstacles	67%	33%	33%	44%
(lamp-posts)	67%	67%	0%	44%
(bridge piers)	0%	0%	0%	0%
(milestones)	33%	33%	33%	33%
elimination of straight lines	100%	83%	50%	78%
(to avoid the monotony)	83%	83%	50%	72%
shrubs planted in central reservations	100%	100%	100%	100%
(to cut down on the dazzle)	100%	100%	67%	89%
((of oncoming traffic))	100%	67%	67%	78%
Motorways are becoming faster, safer, less tiring	33%	0%	0%	11%
Birth of new civilization	33%	33%	33%	33%
Leisure: freedom and no queues upon returning home	100%	33%	100%	78%
Work: motorways help business drivers	100%	67%	33%	67%
Life returns to abandoned villages	100%	0%	100%	67%
In Germany, there are x number of relais- restaurants	100%	67%	33%	67%
X	68.18%	58.57%	51.54%	59.09%
S.D.	31.87	32.37	29.67	24.03

	Input	Note-taking Phase	Consecutive Delivery	Recall	Recall when Notes removed
Words	$\bar{X} = 423$	175	427.78	316	274
Meaning units	$\bar{X} = 90.33$	66.94	77.42	46.92	35.94
Nouns	$\bar{X} = 101.67$	67.89	110.67	72.89	68.44
Adjectives	$\bar{X} = 40.67$	23.89	35.33	26.11	21.56
Prepositions	$\bar{X} = 76.67$	16.55	66.55	48.11	42.67
Adverbs	$\bar{X} = 17.33$	6.55	12.00	7.33	7.67
Pronouns	$\bar{X} = 23.33$	1.00	16.89	17.55	14.78
Digits	$\bar{X} = 12.00$	11.67	12.33	9.44	7.22
Verbs	$\bar{X} = 38.67$	10.67	47.78	37.67	32.56
Verbs + symbols	$\bar{X} =$	17.33			
Articles	$\bar{X} = 56.67$	0	37.89	23.78	18.11

Table IV - 12

The effects of each phase of consecutive delivery on notes' content.

To summarize the results obtained in the present chapter, it is apparent that by way of notes, the learner (in this case, the consecutive interpreter) transforms stimulus inputs and stores the results of the transformation in memory. This concept is referred to as coding, where coding is an extraction of semantic information. The interpreter's use of semantic codes often facilitates both the learning and the retention of stimulus information.

Posner and Warren (1972) reviewed various studies concerned with coding and suggest that there is evidence for at least three different types of code which may result from perception of a single stimulus. First, there is the physical code: the information in the physical code includes the particular acoustic or visual details of structures that characterize stimulus presentation. For the consecutive interpreter, the physical code also includes a language stimulus which he must be able to recognize upon perception in order to transcribe it in the same language in his notes or preferably process it deeply enough to translate the stimulus words into an English code.

Once a word has been presented, the physical code is rapidly followed by what Posner and Warren call the name code. This code consists of the name of the stimulus word and the names of related words. The name code is independent of the mode of stimulus presentation and of idiosyncrasies in form of presentation which are represented in the physical code. An example of the name code is the systematic use of the initial 'm' among interpreter-subjects to label all stimulus words related to the concept of 'motorway' or 'road' or 'highway', irrespective of the stimulus word.

The third type of memory code distinguished by Posner and Warren, is based on conscious constructions on the part of the individual when experiencing the stimulus input. Codes of this

type result from active, conscious operations performed upon stimulus inputs and are not the result of the automatic processes that give rise to physical or name codes. Examples of this third type of coding among interpreters' notes may include, for example, the deliberate transformation of the stimulus word 'phares' (in French) ('headlights' in English) into the graphic symbol: ○○.

Still, according to Posner and Warren, the physical code is only effective for a short time, as in short-term memory. After this period, it is then replaced by some sort of semantic code that is relatively permanent. The physical and name codes are relatively passive and automatic. Codes developed in this manner depend on the inherent organization of the information processing system and on habits or sets acquired through past experiences. The other class of coding operations is both active and conscious.

Thus the conscious transformation of certain stimulus words on the part of the consecutive interpreter may provide a partial explanation for the high frequency in recall of items most frequently transformed into graphic symbols by the interpreter when taking notes. Table IV-11 on page 293 provides the most frequently recalled propositions, namely:

- that shrubs were planted in the central reservations;
- that shrubs cut down on the dazzle of oncoming traffic headlights;
- that dual carriageways were introduced;
- that the strategy turned against Hitler during the invasion.

... and shrubs are planted in the central reservations.	trees ' ○
... cut down on the dazzle of oncoming traffic.	so driver X dazzle ○○
... introduction of dual-carriageways.	1-way
... the strategy turned against Hitler when Germany was invaded.	strat gst D invaded ↷

The previous findings would also support the concept of mental imagery to aid recall (Norman, 1969b; Paivio, 1965, 1969).

Bower (1972) suggests four main types of coding operations, namely stimulus selection, re-writing, componential description and elaboration.

Coding by stimulus selection refers to the explicit selection by a subject of some component of a complex stimulus. The component selected is then used as the critical element of the complex. In this respect, Underwood (1963) draws a distinction between the nominal stimulus (i.e. what is actually presented to the subject) and the functional stimulus (i.e. the characteristics of the stimulus that the subject actually uses). Underwood suggests that selection of the functional stimulus may involve an active process in that the subject deliberately chooses certain characteristics of the stimulus as a cue. This may explain why most subjects opted not to record the verb in their notes in three out of four cases, although a very high proportion of verbs were recalled. This finding also supports the Anderson-Bower HAM model where the central pivot of the memory representation is the verb (Anderson and Bower, 1973).

Coding by re-writing involves translating the input into another mode. The translation is then stored in memory and decoded at a later time to mediate recall of the original input. Re-writing also seems to involve an active, conscious operation on the part of the subject (Bower, 1972). As in stimulus selection, there is the implication of a capacity limit placed on codes produced in this way. This explains why some consecutive interpreters prefer to note the word down in the source language, especially if the translation does not come immediately to mind, with the hope that by the time he is expected to provide a consecutive delivery of the passage, he will have come up with an appropriate translation. This may explain why very few of the difficult-to-

translate items were rarely recalled: milestones, lamp posts and bridge piers (See Table IV-11, page 293).

For coding by componential description, the essential nature of this coding operation is that the codes it produces consist of the attributes or features that characterize the stimulus inputs. According to this view, the set of features that constitute a particular code results from a relatively complete analysis of the input. In the case of words, these features may be of both an acoustic and a semantic variety. The semantic features of the word 'JAM', for example, may depend on whether reference is made to a traffic jam or to strawberry jam, whether it is used as a noun or as a verb. Its acoustic features may include the fact that it sounds like ram, dam, ham, etc. One subject, upon hearing 'Hitler' pronounced in French, transcribed the code in her notes as Mr. Eclair and never made the connection between Hitler and the subsequent invasion of Germany.

Finally, the fourth type of coding operation suggested by Bower is based on the assumption that inputs give rise to "associated operators" that transform the to-be-remembered units in a qualitative manner. One illustration of elaboration coding is based on mental imagery. In this case, the stimulus is replaced by a mental image which is then stored in memory. Presumably, both the image and the stimulus have the same referent so that decoding the image for recall is not difficult. This form of coding has been investigated by a number of individuals (Paivio, 1969). As Bower uses the term, elaboration coding is similar to coding by stimulus selection and rewriting in that it seems to require the use of active and conscious processes.

Experimental work with long and somewhat complex texts is not new in psychology (Bartlett, 1932). But only recently have psychologists extended their research from word lists, syntactic structures and semantic structures of sentences to structures

underlying texts (Kintsch, 1974).

Verbal behaviour exhibited in recall and summary experiments depends on the subject's assignment of specific structures to the input materials. Subjects presented with a text are known to be unable to reproduce the text verbatim after one presentation, nor are they able to reproduce all the propositions of the text. In the recall protocols, part of the propositions are 'forgotten', whereas others are 'combined' into one proposition.

Predicting the outcome of such behaviour is not possible by merely looking at the semantic or syntactic structure of the individual sentences or clauses in the input text. Recall is more a function of the position of the individual clauses or propositions with respect to other clauses or propositions (van Dijk, 1976).

To account for the processes underlying production and comprehension, storage and retrieval of discourse, most theoretical models cannot predict which propositions of a discourse will have low or high probability of being recalled in reproduction or used in summary. What may be predicted are some primacy and recency effects, and perhaps a preferred selection of those propositions which are semantically 'predominant', as defined in terms of the number of propositions with which they are connected.

According to Rumelhart (1975, 1977), people build up a hierarchy as they listen to stories, identifying each unit (normally each sentence) as some part of this hierarchy: a setting, event, action, change-of-state, internal response, overt response and so on. By the end, they have constructed a global representation of the story.

Stories should be recalled according to their hierarchical structure. The higher a sentence in the hierarchy, the more likely it should be recalled. Thorndyke (1977) confirmed this by identifying the level of sentences in the hierarchical graphs of



several stories. The highest-level sentences were recalled 95% of the time and the lowest-level ones, only 50%.

In conclusion, remembering is a reconstructive process (Bartlett, 1932). To recall a text, people retrieve bits and pieces of what is stored in memory and use them to reconstruct what they could plausibly claim to be the original sentence. To do so, they fill in missing details based on their knowledge of the situations, beliefs and customs. They are also heavily swayed in their choice of constructions by a bias towards normality (Clark and Clark, 1977). When the discourse has a structure of its own, as stories do, people try to reconstruct a passage that fulfills the prerequisites for that type of discourse.

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## CHAPTER VI

### GENERAL CONCLUSION:

#### EXPERIMENT I:

The results obtained in Experiment I, where male, female, beginner and professional interpreters were asked to a) listen to, b) shadow, c) interpret simultaneously and d) interpret consecutively French passages, followed by recall in English and recognition tests in French, seems to support those obtained by Gerver (1974) in that simultaneous listening and speaking, which occurs during shadowing and simultaneous interpretation, can impair subsequent recall of the material processed whilst vocalizing. Thus, the need to share attention between input, processing, and output, impairs the shadower's and the interpreter's ability to understand and retain what he hears.

Tasks that require overt vocalization by the subject during processing, that is where there is masking by the subject's own voice, as is the case for shadowing and simultaneous interpretation, or tasks which are relatively short in terms of time allowed for processing, that is tasks which offer no opportunity for rehearsal or mental review, were lower in terms of subsequent recall scores than either listening or consecutive interpretation which, on the contrary, do not require overt vocalization on the part of the subject during the encoding stage, thus allowing for mental review or rehearsal, or, at the very least, covert vocalization or inner speech. Furthermore, the absence of overt vocalization as in listening and consecutive interpretation, assumes longer processing latencies (or processing times) than required for simultaneous interpretation and shadowing, where, by sole virtue of the nature of the tasks, processing times are measured by the lag between the input stimulus and the onset of subjects' vocalization. Such processing times cannot be determined when a subject

listens to a passage. In the case of consecutive interpretation, although there is no overt vocalization required of the interpreter, the note-taking activity can be considered as a written representation of the inner speech the listener may be using in order to process the incoming material and thus merits closer attention.

By placing the results obtained for recall measures along a continuum, it appears as though the highest scores obtained came after listening and consecutive interpretation. Lower scores were obtained on recall scores following the shadowing condition. Within a depth of processing framework, it appears as though listening and consecutive interpretation involve deeper forms of processing than required by shadowing, although certain dissimilarities in the activities required of the subjects during the said activities may also play a part. For example, listening requires no concrete or measurable processing on the part of the subject. The experimenter has no way of measuring processing time, no way of knowing whether the subject is decoding the stimulus message in L<sub>1</sub> or in L<sub>2</sub>. The experimenter simply knew that the subject was able to devote his full attention to the listening task and did not have to:

- speak and listen at the same time (as for shadowing);
- translate and speak at the same time (as for simultaneous interpretation);
- make notes and translate at the same time (as for consecutive interpretation).

Consecutive interpretation was grouped with listening only because subjects were silent during the encoding phase in both conditions. In other words, there was no masking by the subject's own voice. However, any similarity between the two tasks ends there.

Consecutive interpretation allowed subjects to make notes as they listened to the text. Following the note-taking task, subjects were then asked to give a consecutive delivery of the entire text with the use of their notes, thus providing them with a rehearsal or a review period, a factor which was not present in any of the other conditions. It was only after this interpolated activity that subjects were asked to recall, without notes this time, as much of the text as possible. Thus, the onset of recall was delayed in this particular condition, whereas in all other three conditions, the onset of recall coincided with the end of the presentation of the stimulus material.

The two other conditions, shadowing and simultaneous interpretation, also differed from each other in certain respects: although both tasks are considered as somewhat 'limited' in terms of processing time (in that the lag between the stimulus message and the subject's vocalization are considerably shorter than for consecutive interpretation and non-existent for listening) and although both tasks include the masking effect by the subject's own voice, simultaneous interpretation differs from shadowing in that one condition requires translation of the material being processed thus represents more of a type of 'phrase processing' than the 'phonemic processing' involved during shadowing (Norman, 1976). In other words, the lag was longer for simultaneous interpretation than for shadowing. In spite of these two major differences, no significant differences emerged between simultaneous interpretation and shadowing, contrary to Gerver's (1974) findings. Nevertheless, it appears that simultaneous listening and speaking during simultaneous interpretation and shadowing do, in fact, impair subsequent recall of the material processed.

It is by comparing the results obtained on recall scores that some indication emerges as to how much processing or how deep a form of processing is involved during each condition:

Since listening and consecutive interpretation yielded recall scores that were significantly higher than shadowing, we can conclude that listening and consecutive interpretation are deeper forms of processing than shadowing. More extensive research on the differences between simultaneous interpretation and shadowing is required before any conclusions can be drawn regarding the depth to which each task is processed. Although there were no significant differences between the recall scores following either activity, a trend was noted in that scores were somewhat higher on recall scores following simultaneous interpretation, higher than those obtained following shadowing. Any significant differences found here would support Gerver's notion that recall is better when more complex information processing (as for simultaneous interpretation) is an integral part of simultaneous listening and speaking than when a relatively simple form of processing is involved (as in phonemic shadowing).

With regard to recognition measures, listening was the only condition to yield scores that were significantly higher than those obtained following shadowing. This once again confirms the results obtained with the recall measures in that listening is a deeper form of processing than shadowing and that a task which allows a subject to devote his full attention to processing will yield higher recall scores than a task where simultaneous listening and speaking can impair recall of the material processed while speaking (as is the case during shadowing). Contrary to results obtained with recall measures, consecutive interpretation did not yield recognition scores that were higher than those obtained after shadowing. Since recall measures were carried out in English and the message had been presented to the subject in French, the presence of a translation factor could be one possible explanation. Recognition measures, on the other hand, were administered in the same language as that of presentation,

namely French, thereby eliminating both code-switching and translation as possible variables. Another reason may simply be the difference between recall and recognition measures, where only recall was sensitive enough to detect any differences in terms of depth of processing. (Lockhart, Craik and Jacoby, 1976).

The semantic recognition test yielded the highest mean scores, followed by lexical recognition tests, which in turn were followed by word-order recognition tests. These results support Sachs' (1967) notion that memory for syntactic (word-order) changes was near chance level, but that memory for semantic changes remained high.

Recognition scores following listening ( $\bar{X} = 87.50\%$ ) were significantly higher than scores following consecutive interpretation, which in turn were significantly higher than scores after simultaneous interpretation, which in turn were significantly higher than those following shadowing, on the semantic recognition test.

When subjects were asked to listen to a passage, male professional subjects performed significantly better ( $\bar{X} = 76.42\%$ ) than female professionals ( $\bar{X} = 70.42\%$ ). When subjects were asked to interpret a text simultaneously, male professionals' recognition scores were significantly higher ( $\bar{X} = 72.33\%$ ) than those obtained by male beginners ( $\bar{X} = 63.67\%$ ). This slight advantage in favour of male subjects can be explained as follows: either by the fact that male subjects tend to want to please the experimenter (a female) more than the female subjects or by the fact that female subjects asked to shadow and simultaneously interpret another female voice (that of the experimenter), where similarity in pitch and timbre may have been more of a potential source of interference than for male interpreters.

To recapitulate, listening seems to be the deepest form of processing when compared to other tasks where two or more con-

current activities may be competing and not allowing the subject to devote his full attention to the incoming message; shadowing, where subjects are forced to devote a substantial portion of attentional capacities to listening and speaking; simultaneous interpretation which involves not only listening and speaking but translation as well; and consecutive interpretation which includes listening, translation and note-taking, although this condition yielded higher recall scores than did shadowing.

By placing the four activities required by interpreters along a continuum, listening and consecutive interpretation would be considered as the deepest types of processing, followed by simultaneous interpretation and finally by shadowing, requiring the shallowest processing.

#### EXPERIMENT II:

Experiment II set out to determine how deeply messages are processed when translation is not required of subjects. Therefore, of the four conditions examined in Experiment I, namely (1) listening, (2) shadowing, (3) simultaneous interpretation and (4) consecutive interpretation, only those conditions which allowed processing without code-switching were selected, that is (1) listening, (2) shadowing and (4) consecutive interpretation where subjects could listen to a passage in English and recall it in English; shadow a passage in English and recall it in English; and, for consecutive interpretation, listen to a passage in English, make notes on it in English, give a consecutive 'reiteration' of it in English (since the term interpretation implies translation) and finally, recall it in English. For obvious reasons, such monolingual designs could not be carried out with simultaneous interpretation since the very nature of the task automatically implies translation.

Since some of the subjects who served in Experiment I also served in the second experiment, different texts had to be used rather than an ideal translation of those used in Experiment I. For this reason, no direct comparison was possible between the two experiments. But by eliminating the translation factor and by selecting passages of the same nature and level of difficulty as those used in Experiment I, it was hoped to determine whether translation per se represents a form of processing and whether any difference would emerge in the amount and quality of recall when language of presentation was the same as that of recall.

Results indicate that consecutive reiteration ( $\bar{X} = 44.11\%$ ) yielded recall scores that were significantly higher than shadowing ( $\bar{X} = 33.89\%$ ). Contrary to the results obtained in Experiment I, listening was not significantly higher than shadowing ( $\bar{X} = 39.11\%$  and  $\bar{X} = 33.89\%$ , respectively). Therefore, listening to a text in one language (French) and preparing to recall it in another language (English) may require more effort or attention on the part of the subject than when he simply listen to a passage in one language (English) knowing he will be asked to recall it in the same language. Consecutive interpretation in Experiment I ( $\bar{X} = 45.00\%$ ) yielded virtually the same recall scores as consecutive reiteration in Experiment II ( $\bar{X} = 44.11\%$ ). The same applies to shadowing where for Experiment I, recall following shadowing yielded a mean average of  $\bar{X} = 30.19$  meaning units and  $\bar{X} = 33.89\%$  for Experiment II. In other words, shadowing and consecutive interpretation did not seem to require any deeper processing on the subject's part whether the input was presented in one language or the other, but listening to a passage in a foreign language and preparing to recall it in another seems to require deeper processing on the subject's part than merely listening to a passage in his or her mother-tongue and preparing to recall it in the same language.



Although listening ( $\bar{X} = 45.19\%$ ) shows a 15% advantage over shadowing ( $\bar{X} = 30.19\%$ ) in the translation condition in Experiment I, this difference drops to 5.22% in the no-translation condition of Experiment II, where listening yielded recall scores of  $\bar{X} = 39.11\%$  and shadowing,  $\bar{X} = 33.89\%$ .

While there is a slight, albeit insignificant advantage for Experiment I (translation) over Experiment II (no translation) for recall, there is a clear advantage for the monolingual processing condition (English into English) over the bilingual condition (French into English) for recognition measures. This suggests that recall, which requires organization and reconstruction and where depth of processing is not hindered by translation is, to the contrary, slightly enhanced by translation. Recognition, on the other hand, which relies on accurate verbatim encoding is disrupted by translation, a process which ignores the precise form of words in favour of their meaning. This last point is bolstered by the semantic recognition scores which were higher for listening and consecutive interpretation in Experiment I.

Another possible explanation for the clear advantage for Experiment II over Experiment I for recognition is that recognition measures in Experiment II were administered in the subjects' mother-tongue, English, whereas in Experiment I, they were administered in the same language as that of presentation of the input messages, namely, French, the subjects' passive language. This could be explained by Tulving's encoding specificity principle (Tulving, 1979) where recall is not so much dependent on the depth to which a message is processed but on the compatibility relation between the trace (i.e. the information which is stored in memory) and the cue (i.e. the information available to subjects at the time of the attempted retrieval). In other words, recognition measures which are administered in the same language as language of presentation are more compatible with subsequent

retrieval of information than recognition measures which are administered in a language other than that of presentation. Such code-switching may not be compatible with retrieval of information.

Similarly to the results obtained in Experiment I, listening and consecutive 'reiteration' yielded higher results on retention scores than shadowing, confirming the hierarchy proposed in Experiment I that listening and consecutive interpretation, or in this case reiteration, are deeper forms of processing than shadowing.

### EXPERIMENT III:

A third experiment examined the role played by consecutive notes by comparing the results obtained on recall and recognition tests following listening, consecutive interpretation with notes kept, followed by recall without notes and finally after the 'experimental' condition, where subjects were led to believe that a straight-forward consecutive delivery was in progress (so that they would take their notes in their customary fashion) but where the notes were suddenly and unexpectedly removed before their consecutive delivery and where they were asked to recall without the interpolated activity of consecutive delivery as in the second condition as well as without having their notes to refer to.

The reason for omitting consecutive delivery in this manner was to allow the examination of the facilitation of recall due to the act of note-taking alone. Thus the effect of any encoding processes involved during note-taking would thus be isolated from the effects of external storage mechanisms, that is using notes as a rehearsal device for review.

Results indicated that note-taking, when coupled with review represents a useful strategy for affecting subsequent recall; note-taking alone though is of questionable value. This notion is supported by the fact that significantly higher scores were

obtained following consecutive interpretation with notes kept condition ( $\bar{X} = 46.91$ ) than following either the listening condition ( $\bar{X} = 38.50$ ) or consecutive interpretation where notes were removed ( $\bar{X} = 35.94$ ).

The above findings support the encoding hypothesis of note-taking which suggests that the act of taking notes results in a transformation of the passage material. This transformation involves some processing beyond verbatim learning such as organizing and/or sifting out relevant material (Di Vesta and Gray, 1972). Instead of interfering with learning, note-taking appears to sensitize the note-taker to certain aspects of communication. The transformation is one of acting on the incoming information, sifting out relevant material and organizing important content which is then recorded by the consecutive note-taker. Note-taking and rehearsal serve as learning aids which facilitate encoding. Review provides an opportunity for consolidating the information learned at a given level of transformation. The types of transformation that may be involved include associative, conceptual and inferential transformations (Di Vesta and Gray, 1972; Weener, 1972).

All note-taking is an elaborative process: material is being elaborated through associative linking with other material in long-term memory. If the notes conceptually or inferentially represent (i.e. paraphrase or summarize) the material in the incoming message, then chunking or encoding according to categories available in long-term memory has occurred. Thus, note-taking is viewed, at least to some extent, as an active form of processing the incoming material.

The behaviour of the subject employing encoding or other transformational processed reflects a transaction between the learner and the material to be learned, that is, it assumes or suggests an active learner. The consecutive interpreter has

taken the necessary initiative to put the material into long-term store; through encoding, the learner has linked the material into his existing cognitive structure, in other words, he has made it meaningful.

The notes which a particular individual has prepared provide a version of the information presented which is more readily understandable to him than an alternative version, something prepared by the lecturer, for example. There is a good deal of evidence to support the suggestion that the notes an individual makes himself are especially useful to him and him alone. Research into organizational factors in human learning and memory contributes much evidence about the value of encoding functions of the kind which appear to enter into some forms of note-taking. It is clear that the ability to retain verbal information in large quantities depends upon the learner being able to impose a degree of organization upon the materials being processed. Learners are considerably better at remembering information which they have produced or reproduced themselves than at recalling material which has been presented to them, without reproducing it (Howe and Godfrey, 1977).

Encoding on the part of the learner which is involved in the production of notes has an effect upon his learning, distinct both from any attentional factors and from the utility of the individual's completed notes as such. Learning is related to the extent to which individuals undertake the cognitive processes involved in coding, integrating and transforming the information which is presented to them. Consecutive interpreters undertake a good deal of encoding, thereby transforming information presented to them into their own words, rather than satisfying themselves with an attempt at a verbatim copy.

On the other hand, with regard to the external storage hypothesis which indicates that notes are taken in verbatim style for later use for recall purposes, note-taking per se does not appear

to enhance recall unless learners are given the opportunity to review their notes prior to recall. The external storage hypothesis suggests two possible functions for notes:

- 1) the rehearsal function whereby enhanced recall is only due to recall of material from the notes just reviewed. In this case, a subject who is allowed to keep his notes for review purposes would exhibit superior recall to another subject allowed to take notes but prevented from reviewing notes prior to recall, but not superior to recall on the part of a subject who is merely asked to listen to the same passage without making any notes whatsoever.
- 2) a reconstruction function which suggests that the recall of notes allows learners to reconstruct parts of the passage on which no notes were previously taken. Consequently, a condition where subjects are allowed to take notes but prevented from reviewing them would exceed a condition where subjects both take notes and keep the notes for consecutive delivery as well as pure listening where no notes are permitted.

Subjects who take notes and have notes for review will outperform those who only take notes without review or those who take no notes at all.

While one interpretation of the external storage hypothesis is that learners will only recall material contained in their notes (rehearsal), another possible interpretation is that the notes recalled will allow learners to reconstruct other passage material (reconstruction),

It is conceivable that the note-taking activity per se makes a contribution of some sort to later retention that is additional to the effects of the encoding processes that precede the production of notes. Notes provide a means of reproducing and storing knowledge for later consultation. Taking notes may contribute in a relatively direct manner to the individual's acquisition of personal knowledge, that is, his learning. Taking notes can also help

an individual attend to the material he is trying to acquire.

Another possible outcome of note-taking is that the specific and particular version of the original material that an individual has thus prepared, constitutes one which, by virtue of the coding operations that have gone into its preparation, is especially meaningful and understandable to that particular individual.

Another way that note-taking might reasonably be expected to influence performance is through the activities that occur at the time of note-taking, or the coding and processing operation which each person undertakes as he deals with the information presented to him, making a direct contribution to his learning.

More pertinent to the consecutive interpreter is the notion that the most opportune time for consolidation may be the period immediately following a lecture, during which time the subject can review and contemplate the content of the presentation.

Finally, notes are an excellent source for predicting what will be recalled. One of the most interesting features of this research was the high agreement between consecutive interpreter-subjects. Much of what was recorded in the notes was a series of epigrammatic phrases, identical to the words used in the input passage (that is, an ideal translation), suggestive in themselves of the complexity of note-taking.

In addition to the basic tasks common to all forms of translation activities, consecutive interpretation is special because of the added factors of the temporal cues such as note-taking. Consecutive interpretation draws on cognitive faculties of memory and attention which are atypical of other forms of translation.

Implicit to the methodology of note-taking is the conversion of a given message into its basic conceptual units, into a conceptual form or into its underlying abstract form. The interpreter must decode the message into its abstract form before understanding translation, before processing to encode the message into the target

language. Thus, the intermediary steps of all translation activity, that of the exegesis, finds further extension and elaboration in consecutive interpretation: it is recorded in external form in the interpreter's notes (Garretson, 1982).

Consecutive interpreters seem to be able to extract the meaning of the material from its external form, store this information in an abstract form, and, in the course of recall and recognition, reconstruct the stored material anew, imposing on it a new grammatical and syntactic structure.

Long term memory seems to involve recall of the meaning of the perceived message and is essentially reconstructive by nature, a finding which would explain the high percentage of elaboration found in the subjects' recall in the present experiment, in spite of a 50% drop in the amount of information recalled. The consecutive interpreter is performing operations common to normal language use in the perception and comprehension of the message to be translated, but he must take this operation one step further by making a record of this underlying or semantic representation in the form of notes.

Garretson (1982) claims that translation is not possible without a decoding of the message into its underlying, conceptual form; that translation is not possible without exegesis and, in the case of consecutive interpretation, not possible without a record of the result of the exegesis. According to Garretson, furthermore, during the stage of comprehension and exegesis, propositional representations are formed without the decomposition of the lexical units involved. Kintsch (1974) argues that, in memory, words may indeed be preserved in a decomposed form, but that they are not automatically decomposed during comprehension. Thus, in sentence comprehension, one is dealing not with a decoding into semantic features, but into meaning postulates, upon which the listener can draw if circumstances require it.

Thus, Kintsch is suggesting a language of internal representation in the comprehension and production of speech which is less removed from the surface structures of speech and of natural language than previously thought. For example, in consecutive interpretation, the use of individual symbols or abbreviations to render a complete range of semantic clusters seems to support a decompositional approach.

The symbol " can render the following: to express; to declare; to state; to maintain; to say; to announce.

The symbol : can render the following: to think; to consider; to feel; to evaluate.

These provide ready examples of the decomposition of the word to be translated into its minimal, invariant component (Rozan, 1959).

- ↗ d'un pays (development of a country)
- ↗ science (progress in science)
- ↗ malade (convalescence)
- ↗ maladie (recrudescence)
- ↗ salaries (increase in wages)
- ↗ level vie (rise in the standard of living)
- ↗ prix (rise in prices)

Rozan, 1959, p.32

Furthermore, one symbol can represent different functions. For example, the arrow can replace a verb, a noun or an adverb.

m'w ↗ -t

The motorway was born out of unemployment.

D Δ ↗ car

Germany had foreseen the incredible emergence of the automobile.

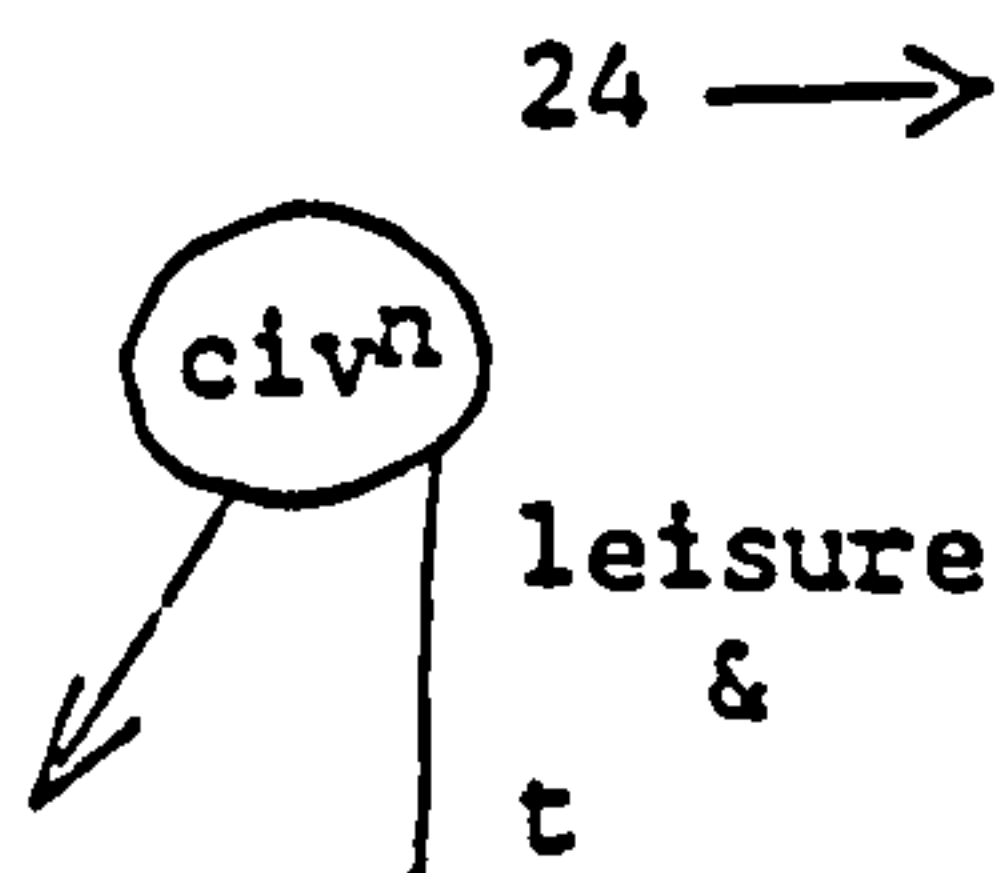
→ uney

... in order to feed the unemployed.

✓ → far  
calm nature

They can go far to seek nature's calm.





As early as 1924, ...

(Used here to recall or refer to a previously mentioned item).

The lexical items and phrases have been reduced to their major common component, with a notation of the distinguished features. The symbol can thus render a broad range of synonyms and contextual variants of a given semantic cluster (increase, recovery, upswing, expansion, development, progress, improvement, rise) whose form in the target language can be determined by contextual factors.

Complex words are frequently treated as unitary concepts.

For example:

W (world)

t (work)

TR (trade)

? (question or problem)

□ or ○ (country)

Rozan, 1959, p. 35

Kintsch (1974) found that complex and simple words (which he labeled as 'derived' and 'non-derived') were treated alike as unitary concepts. In his words, they were:

"... equally difficult in terms of generating a sentence from a given word completing sentences, sentence comprehension and memory".

" A theory of memory in which both derived and non-derived words are represented in the same way as lists of propositions specifying their use agrees best with these results".

Kintsch, 1974, p. 240

There is some evidence to suggest that writing down key words and actively transforming incoming information helps

retention when taking notes. Recent research on note-taking has introduced a dramatically different approach both to studying in general and to note-taking in particular; that of patterning. The original concept behind patterned notes came from a note-taking style described by Hanf (1971) which was called 'mapping' and which was designed specifically as a technique for drawing information from prose material. Hanf suggested putting the central idea in the middle of the page and attaching subsidiary ideas concentrically. Later, Tony Buzan (1974) recommended that the learner identify the central argument or concept in the information-to-be-processed and represent this by a key word or phrase placed in the middle of the page. From this central point, a structure was built using arrows, shapes, pictorial illusions and lines radiating from the central concept.

The rationale behind Buzan's idea is that although we are accustomed to processing information presented to us in a linear sequence, the brain itself does not necessarily function in the same way.

The important advantage of patterning over linear notes for recall purposes appears to depend on two factors: 1) the use of key words or phrases and 2) the active involvement of the learner in transforming incoming information when taking patterned notes.

The key words are usually nouns or verbs (Russell, 1979), sometimes accompanied by adjectives and adverbs. This may explain why subjects in the present experiment made such extensive use of nouns (64% kept in the notes), adjectives (60% kept in the notes) and verbs (53%).

Russell agrees that key words tend to be nouns or verbs, usually concrete rather than abstract nouns and that these key words are most memorable and carry the essential information of the sentence or the paragraph.

Thus note-taking serves both encoding and external storage functions. When coupled with review, note-taking enhances recall. The encoding hypothesis implies that the interpreter is actively involved in imposing his own organization and categorization on the incoming information. The external storage hypothesis implies that he is merely acting as a passive recorder of information. However, when notes are suddenly removed from the consecutive interpreter, thus preventing him from putting his notes to normal use and thus preventing him from rehearsing and reviewing the material processed, then note-taking does take on all the negative aspects of external storage where notes are taken in a verbatim fashion, that is on an external level. Notes per se are of little value. It is immediately following note-taking, when the interpreter decodes and reconstructs information that the learning takes place.

Of the four tasks performed by interpreters in general, namely (1) attending to (i.e. listening), (2) shadowing, (3) simultaneously interpreting and (4) interpreting consecutively, consecutive interpretation seems to offer cognitive psychologists the most concrete data as to the nature of the ongoing activities carried out during such a complex form of human information processing. For the experimenter, these notes may be interpreted as a tangible representation of the inner speech that one may be carrying out during a listening task.

In this experiment, interpreter-subjects were asked to translate their notes immediately as they wrote them down so that for a message presented in  $L_1$  (French), notes were taken in  $L_2$  (English). Future research of interest to psychologists as well as linguists would be to examine the differences in recall when subjects are asked to take notes in the same language as that of presentation ( $L_1$  French), thereby delaying translation until the actual consecutive delivery. Translation could be delayed

one step further: notes and consecutive delivery all carried out in language of presentation ( $L_1$  French), followed by recall in  $L_2$  English.

Although there may be a certain amount of shared attention between listening and note-taking, these two concurrent activities do not seem to impose as great a load on the subject as during shadowing or simultaneous interpretation, for example, where the ongoing activities (listening and speaking) prevent the interpreter from processing the incoming information deeply enough for him to recall it as well. The absence of any voice-masking effect during note-taking, coupled with the compatibility between the ongoing activities, namely attending to an aurally presented message and encoding it in writing, are probable reasons.

Finally, consecutive delivery offers the interpreter the opportunity to rehearse the material completely from beginning to end, a variable not present during listening, shadowing or simultaneous interpretation. Consecutive delivery per se is an interpolated activity between the encoding phase (note-taking) and the recall phase which serves to strengthen the learning activity in spite of the possible decay involved as a result of the onset of recall being delayed in this condition and not in the other three: listening, shadowing and simultaneous interpretation.

Judging by the scores obtained on recall and recognition measures, consecutive interpretation involves the deepest and most intricate form of processing required of an interpreter within the depth of processing framework.

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Chapter III

Experiment II

Experimental Design:

Listening Text A	Shadowing Text C	Consecutive reiteration Text B
Shadowing Text B	Consecutive Reiteration A	Listening Text C
Consecutive Reiteration Text C	Listening Text B	Shadowing Text A

(n=9)

Chapter IV

Experiment III

Experimental Design:

Listening Text D	Consecutive notes kept Text E	Consecutive notes removed Text F
Consecutive notes kept Text F	Consecutive notes removed Text D	Listening Text E
Consecutive notes removed Text E	Listening Text F	Consecutive notes kept Text D

(n 9)

## Chapter II

## Experiment I

## Experimental Design:

Subjects 1,5,9 & 13	Listening Text A	Simultaneous Text B	Consecutive Text C	Shadowing Text D
Subjects 2,6, 10 and 14	Consecutive Text B	Shadowing Text A	Listening Text D	Simultaneous Text C
Subjects 3,7, 11 and 15	Shadowing Text C	Consecutive Text D	Simultaneous Text A	Listening Text B
Subjects 4,8, 12 and 16	Simultaneous Text D	Listening Text C	Shadowing Text B	Consecutive Text A

Text A Le Camping (Camping)

Text B La Maladie des Cosmonautes (Astronauts' Illness)

Text C Le Tunnel Sous la Manche (The Channel Tunnel)

Text D L'alcoolisme (Alcoholism)

n = 16

Appendix A-1

La maladie des cosmonautes

Les vols de l'homme dans l'espace seraient plus dangereux pour la santé des cosmonautes qu'on ne le pensait généralement jusqu'à présent. Ils laisseraient des séquelles telles chez certains cosmonautes que quelques-uns d'entre eux ne seraient plus bons pour un autre départ dans le cosmos. Une nouvelle venant des Etats-Unis annonce en effet que le cosmonaute Alan Sheppard, premier Américain envoyé dans l'espace souffre de troubles de l'oreille interne se traduisant par des pertes d'équilibre et qu'en conséquence il ne pourra sans doute pas participer à d'autres vols spatiaux. Sheppard est ainsi le troisième cosmonaute américain sur six à souffrir, bien après son vol - il a effectué ce dernier le 5 mai, 1961 - de troubles de l'oreille interne, cet organe, qui, avec l'appareil vestibulaire et les canaux semi-circulaires, permet à l'homme d'avoir le sens de l'orientation et de l'équilibre. Avant lui, l'astronaute John Glenn, après avoir glissé malencontreusement dans sa baignoire - la chute s'est produite plusieurs mois après le vol - a dû être soigné pendant près d'un an. Il était sujet à de fréquents étourdissements. Enfin, au début de l'année dernière, l'astronaute Walter Schirra contracta à l'entraînement une infection de l'oreille interne. Le premier astronaute qui souffrit assez douloureusement de l'oreille interne pendant le vol même fut Guerman Titov qui devait déclarer quelque temps après, au congrès international d'astronautique, qu'il était possible qu'il ne vole plus. Bien qu'il faille être, bien entendu, extrêmement prudent en voulant voir une relation de cause à effet entre la chute d'un cosmonaute et son vol dans l'espace, il est tout de même troublant de constater que Youri Gagarine, lui aussi, à l'instar de John Glenn, a glissé plusieurs mois après son vol dans un chemin caillouteux de Crimée en se faisant une profonde blessure au front. Plusieurs cosmonautes ont donc perdu

(continued on next page...)

l'équilibre et sont tombés. D'autres, affectés de troubles de l'organe de l'équilibre, ne voleront plus. Au printemps, Américains et Russes démentaient que ces maladies soient liées aux vols de l'espace. Pourtant, depuis, les Soviétiques ont proposé aux Américains une collaboration dans le domaine de la biologie et de la médecine spatiale. Mais toute conclusion définitive sur les effets sur l'homme du vol dans l'espace serait hâtive et la vérité n'apparaît que peu à peu.

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Appendix A-3 (translation)

Astronauts' illness

Man's flight into space may be more dangerous for astronauts' health than previously thought. These would have after-effects among certain astronauts such that some of them would no longer be suitable for another flight into space. A news item from the United States says, in fact, that astronaut Alan Sheppard, first American sent into space, suffers from inner ear troubles translated as a loss of balance and that as a consequence, he will probably no longer participate in future space flights. Sheppard is thus the third American astronaut out of six to suffer - long after his flight, which took place on May 5th, 1961, from problems of the inner ear, the organ which in conjunction with the vestibular apparatus and semi-circular canals, gives man his sense of direction and his sense of balance. Before Sheppard, astronaut John Glenn, after having slipped in his bathtub - his fall occurred several months after his flight - had to be treated for nearly a year. He had frequent dizzy spells. Finally, at the beginning of last year, astronaut Walter Schirra, during training, developed an inner ear infection. The first astronaut to suffer quite painfully of the inner ear during an actual space flight was Guerman Titov who declared later on, at the international astronomical congress that it was possible that he would never fly into space again. Although one should be very careful in trying to establish a cause and effect relation between the fall of an astronaut and his flight in space, it is nonetheless most unsettling to note that Yuri Gagarin, just like John Glenn, slipped several months after his flight on a rocky path in the Crimea, and made a deep gash in his forehead. Several astronauts have thus fallen after losing their balance. Others, afflicted by problems of the inner ear, will no longer partake in space flights.

(continued on next page.../)

In the spring, Americans and Soviets denied that these 'illnesses' were due to flights into space. However, since then, the Soviets have proposed to the Americans a collaboration in studies in biology and space medicine. But any definitive conclusion on the effects on man of space flights would be hasty and the truth will only emerge slowly.

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Appendix A-5

Word Recognition Test

La Maladie des Cosmonautes

Circle "yes" if the word printed below appeared in the story.

Circle "no" if the word did not appear in the story.

Please answer all items even if you have to guess.

NB: The items are in French.

envolées	yes	_____	no	_____
nocifs	yes	_____	no	_____
voleront	yes	_____	no	_____
orientation	yes	_____	no	_____
interne	yes	_____	no	_____
annoncer	yes	_____	no	_____
premier	yes	_____	no	_____
nausées	yes	_____	no	_____
souffrir	yes	_____	no	_____
troublant	yes	_____	no	_____
infection	yes	_____	no	_____
affligés	yes	_____	no	_____
niaient	yes	_____	no	_____
espace	yes	_____	no	_____
developpa	yes	_____	no	_____
coupure	yes	_____	no	_____
réserve	yes	_____	no	_____
laisseraient	yes	_____	no	_____

Appendix A-6

Semantic Recognition Test

La Maladie Des Cosmonautes

Please answer the following questions by circling one letter per question.

If you are unsure, please guess; the sentences are in French.

1. L'oreille interne permet à l'homme
  - a d'avoir un appareil vestibulaire;
  - b d'avoir le sens de l'orientation et de l'équilibre;
  - c de participer aux vols spatiaux;
  - d d'avoir le sens de l'équilibre;
2. La nouvelle que certains astronautes ne seraient plus 'bons' pour un autre départ dans le cosmos nous vient
  - a du congrès international d'aéronautique;
  - b de l'Union Soviétique;
  - c de N.A.S.A.;
  - d des Etats-Unis;
3. Guerman Titov
  - a se blessa au front dans un chemin caillouteux de Crimée;
  - b glissa malencontreusement dans sa baignoire;
  - c fut le premier astronaute à souffrir de l'oreille interne pendant le vol même;
  - d souffre de troubles de l'oreille interne et ne pourra sans doute pas participer à d'autres vols;
4. Le premier cosmonaute américain envoyé dans l'espace s'appelle
  - a Walter Glenn;
  - b Alan Sheppard;
  - c Walter Schirra;
  - d John Glenn;
5. Combien de cosmonautes américains souffrent de malaises depuis leur vol?
  - a six;
  - b deux;
  - c quatre;
  - d trois;

(continued on next page.../)

A-7

6. Sheppard a effectué son dernier vol
    - a le 3 mai, 1961;
    - b le 6 mai, 1951;
    - c le 1 mai, 1965;
    - d le 5 mai, 1955;
  7. Youri Gagarine
    - a souffre de troubles de l'oreille interne se traduisant par des pertes d'équilibre;
    - b contracta, à l'entraînement, une infection de l'oreille interne;
    - c glissa dans un chemin caillouteux de Crimée;
    - d glissa malencontreusement dans sa baignoire;
  8. La chute de l'astronaute américain, Glenn, s'est produite
    - a plusieurs mois après le vol;
    - b plusieurs années après le vol;
    - c pendant le vol;
    - d le 7 mai, 1965;
  9. L'oreille interne fonctionne en conjonction avec
    - a les canaux circulatoires et l'appareil vestibulaire;
    - b l'appareil vestibulaire et les conduits semi-circulaires;
    - c les conduits semi-circulatoires et l'appareil vestibulaire;
    - d l'appareil vestibulaire et les canaux semi-circulaires;
  10. Les Soviétiques ont proposé aux Américains
    - a une collaboration dans le domaine de la biologie et de la médecine spatiale;
    - b de démentir que les malaises soient liés aux vols de l'espace;
    - c que ces astronautes ne puissent plus participer aux vols spatiaux;
    - d les trois points, a, b et c.
-

Appendix A-8

Word Order Recognition Test

La Maladie Des Cosmonautes

Please choose the phrase that contains the exact wording of the original.

If you are unsure, please guess.

NB: The items are in French.

- 1 a En effet, une nouvelle venant des Etats-Unis annonce que...  
b Une nouvelle venant des Etats-Unis annonce, en effet, que...  
c Une nouvelle venant des Etats-Unis annonce qu'en effet...
- 2 a Sheppard fut ainsi le troisième cosmonaute américain...  
b Sheppard a été le troisième cosmonaute américain...  
c Sheppard est ainsi le troisième cosmonaute américain...
- 3 a Plusieurs cosmonautes ont donc perdu l'équilibre et sont tombés;  
b Plusieurs cosmonautes sont tombés, ayant donc perdu l'équilibre;  
c Plusieurs cosmonautes, ayant donc perdu l'équilibre, sont tombés;
- 4 a L'astronaute Walter Schirra contracta une infection de l'oreille interne à l'entraînement;  
b A l'entraînement, l'astronaute Walter Schirra contracta une infection de l'oreille interne;  
c L'astronaute Walter Schirra contracta, à l'entraînement, une infection de l'oreille interne;
- 5 a D'autres, affectés de troubles de l'organe de l'équilibre, ne voleront plus;  
b D'autres ne voleront plus, affectés de troubles de l'organe de l'équilibre;  
c Affectés de troubles de l'organe de l'équilibre, d'autres ne voleront plus;
- 6 a Il est portant troublant de constater que Gagarine...  
b Il est tout de même troublant de constater que Gagarine...  
c Il est quand même troublant de constater que Gagarine...

(continued on next page.../)

- 7 a Bien qu'il faille être extrêmement prudent, bien entendu, en voulant voir une relation de cause à effet...
- b Bien qu'il faille être, bien entendu, extrêmement prudent en voulant voir une relation de cause à effet...
- c Bien qu'il faille, bien entendu, être extrêmement prudent en voulant voir une relation de cause à effet...
- 8 a Au printemps, Russes et Américains démentaient que ces malaises soient liés aux vols de l'espace;
- b Américains et Russes démentaient que ces malaises soient liés aux vols de l'espace, au printemps;
- c Au printemps, Américains et Russes démentaient que ces malaises soient liés aux vols de l'espace;
- 9 a Le premier cosmonaute qui souffrit assez douloureusement de l'oreille interne, pendant le vol même, fut Guerman Titov;
- b Le premier cosmonautes qui, pendant le vol même, souffrit assez douloureusement de l'oreille interne, fut Guerman Titov;
- c Le premier cosmonaute qui souffrit assez douloureusement pendant le vol même, de l'oreille interne, fut Guerman Titov;
- 10 a Il était sujet à de fréquents étourdissements;
- b Il souffrait d'étourdissements fréquents;
- c Fréquemment, il était sujet à des étourdissements;
-

Appendix B-1

L'Alcoolisme

Les effets des boissons alcooliques sont aigües - immédiates et chroniques, soit effets habituels. Les problèmes posés par l'alcool sont plus sociaux que médicaux. L'alcool est bénéfique pour calmer l'anxiété mais risque aussi d'en engendrer de nouvelles. Le problème surprend toujours par sa gravité. En vies humaines, en maladies et en équipement, l'alcoolisme coûte chaque année à la France des sommes fabuleuses. Car les chiffres sont formels et même les détracteurs patentés de la statistique ne peuvent les réfuter. En France, l'alcoolisme est en augmentation constante. Qui plus est, notre pays qui ne brille guère depuis quelques années sur le plan des records, en bat un des plus attristants puisqu'une enquête portant sur 17 pays vient d'aboutir à cette conclusion: la France détient désormais le record des décès par cirrhose du foie. Déjà, en 1959, le docteur Mai indiquait au Conseil Economique et Social que 4,5 millions de Français, soit 15% de la population globale, était des buveurs excessifs.

Si l'on ne considère que la population adulte, le Français consomme en effet 30 litres d'alcool pur par an. Cela représente 300 litres de vin courant à 10 degrés, c'est-à-dire la ration moyenne d'un litre par jour qu'autorise l'Académie de Médecine à un travailleur de force. L'occupation allemande si elle fut si souvent génératrice de misères et de drames eut, sans le vouloir, une conséquence bénéfique. Le rationnement du vin d'un demi-litre à un litre par jour fit subitement tomber le nombre de décès par cirrhose du foie. A Paris, et pour 100,000 habitants, ce nombre était en 1938, de 38 décès; en 1944, on en comptait seulement 8, soit près de 5 fois moins. La guerre finie, la courbe de l'alcoolisme

(continued on next page.../)



en France remonte subitement. En quinze ans, de 1945 à 1960, les admissions pour alcoolisme neuropsychologique à l'hôpital de Quimper, par exemple, sont passées de 15 à 550.

Tout se passe comme si, victime de légendes erronées, le Français de 1963 ignorait le péril. Un sondage récent de l'Institut Français de l'Opinion Publique donne des résultats stupéfiants. Plus de 40 pour cent des Français interrogés pensent que la consommation d'un litre de vin par jour n'altère en rien la santé. Mieux: 16% fixent la dose inoffensive à un litre et demi. Ignorance totale ou mauvaise conscience?

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Appendix -B 3-(translation)

Alcoholism

The effects of alcoholic beverages are both sharp or immediate and chronic or habitual. Problems stemming from alcohol are more social than medical. Alcohol is beneficial when calming one's anxiety but it can also create new ones. The problem always surprises us by its seriousness. In terms of human lives, sickness and equipment, alcoholism costs France every year incredible sums of money. The figures are formal and even patented statistical detractors cannot deny them. In France alcoholism is on the increase. Furthermore, France which holds no record over the last few years, is now breaking one of the saddest ones since a survey carried out in seventeen countries has just reached the following conclusion: France now holds the record in the number of deaths caused by cirrhosis of the liver.

Already, in 1959, Dr. Mai told the Economic and Social Council that 4.5 million people in France, in other words 15% of the total population, were excessive drinkers. If we only consider the adult population, the average Frenchman consumes 30 liters of pure alcohol per year. This represents 300 liters of table wine at 10% which is the average ration of one liter per day authorized by The Medical Academy to a manual labourer.

The German Occupation, if it generated misery, had a beneficial consequence without wishing it: wine rationing from one half liter to one liter per day suddenly decreased the number of deaths due to cirrhosis of the liver. In Paris, for 100,000 inhabitants in 1938, the number of deaths was 38. In 1944, there were only 8 deaths reported, which

(continued on next page .../)

is five times less. Once the war was over, the alcoholism curve suddenly shot up in France. In fifteen years, between 1945 and 1960, the admissions for neuro-psychological alcoholism at the hospital in Quimper, for example, went from 15 to 550.

It is as if, victim of erroneous legends, the average Frenchman in 1963, ignores the dangers. A recent survey carried out by the Institute of Public Opinion provides some startling figures: more than 40% of those interviewed felt that drinking 1 liter of wine a day did not harm one's health. Better still: 16% of the answers labeled the harmless dosage at one and a half liters: is this total ignorance of a case of bad conscience?

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Appendix -B 5-

L'alcoolisme

Word Recognition Test

Please indicate which words appeared in the text by circling yes if the word occurred in the original text and by circling no if the word did not occur;

please answer all items even if you have to guess;

NB: The items are presented in French.

pur	yes	_____	no	_____
créer	yes	_____	no	_____
fléau	yes	_____	no	_____
consomme	yes	_____	no	_____
positive	yes	_____	no	_____
apaiser	yes	_____	no	_____
dose	yes	_____	no	_____
sondage	yes	_____	no	_____
stupéfiants	yes	_____	no	_____
gallon	yes	_____	no	_____
ignorait	yes	_____	no	_____
record	yes	_____	no	_____
patentée	yes	_____	no	_____
coeur	yes	_____	no	_____
officiels	yes	_____	no	_____
altère	yes	_____	no	_____
fautives	yes	_____	no	_____
contrer	yes	_____	no	_____

Appendix

L'alcoolisme

Semantic Content Recognition Test

Please answer the following questions by circling the correct letter.

There is only one correct answer per question.

If you are unsure, please guess.

NB: The items are presented in French.

1. En 1959, on apprend que 4.5 millions de Français sont des buveurs excessifs,
  - a soit 10% de la population globale;
  - b soit 40% de la population globale;
  - c soit 15% de la population globale;
  - d soit 5% de la population globale;
2. Le facteur qui réussit à faire tomber le nombre de décès par cirrhose du foie a surtout été:
  - a l'occupation allemande et le rationnement du vin;
  - b la ration moyenne d'un litre imposé par l'Académie de médecine;
  - c les détracteurs patentés de la statistique;
  - d les statistiques erronées pendant l'occupation allemande;
3. Un sondage récent sur la consommation d'alcool chez les Français a été fait par
  - a l'hôpital neuropsychologique à Quimper;
  - b le docteur Mai;
  - c le Conseil Economique et Social;
  - d l'Institut de l'Opinion Publique;
4. Chaque année, le Français consomme une moyenne de
  - a 30 litres de vin courant à 10%;
  - b 30 litres d'alcool pur;
  - c 10 litres d'alcool pur;
  - d 300 litres d'alcool pur;
5. Pendant les années '50, sur 17 pays, la France détenait le record
  - a de décès par cirrhose du foie;
  - b des admissions pour alcoolisme à l'hôpital de Quimper;
  - c d'ignorance totale ou de mauvaise conscience;
  - d de buveurs excessifs et d'alcoolisme;

(continued on next page.../)

6. D'après les résultats du dernier sondage, 16% des Français fixent la dose inoffensive de vin à
    - a un demi-litre par jour;
    - b trente litres par an;
    - c un litre et demi par jour;
    - d un litre par jour;
  7. L'Académie de Médecine autorise à un travailleur de force
    - a un demi-litre par jour;
    - b deux litres par jour;
    - c un litre et demi par jour;
    - d un litre par jour;
  8. En 1938, il n'y a que 38 décès par cirrhose du foie à Paris. Par contre, en 1944, il y eut
    - a 30 décès;
    - b 8 décès;
    - c 5 décès;
    - d 22 décès;
  9. Plus de 40% des Français interrogés pensent que
    - a la consommation d'un litre de vin par jour n'altère en rien la santé;
    - b l'alcool est bénéfique pour calmer l'anxiété;
    - c les effets de l'alcool sont plus sociaux que médicaux;
    - d la dose inoffensive est d'un litre par jour;
  10. Chaque année, l'alcoolisme coûte à la France des sommes fabuleuses
    - a en vies humaines, en maladie et en équipement;
    - b en frais d'ordinateurs lors des sondages;
    - c en frais de clinique à l'hôpital de Quimper;
    - d en enquêtes menées par le docteur Mai;
-

Appendix -B 8-

L'Alcoolisme

Word Order Recognition Test

Please choose the phrase that contains the exact wording of the original.

There is only one correct answer per question.

If you are unsure, please guess.

NB: The items are presented in French.

1. a ... l'alcoolisme coûte chaque année à la France des sommes fabuleuses;  
b ... chaque année, l'alcoolisme coûte à la France des sommes fabuleuses;  
c ... l'alcoolisme coûte chaque année des sommes fabuleuses à la France;
2. a Le problème est grave et il surprend toujours;  
b Le problème surprend toujours par sa gravité;  
c La gravité du problème surprend toujours;
3. a Subitement, la courbe de l'alcoolisme remonte en France, la guerre finie;  
b La guerre finie, la courbe de l'alcoolisme remonte subitement en France;  
c La guerre finie, la courbe de l'alcoolisme en France remonte subitement;
4. a Tout se passe comme si le Français de 1963 ignorait le péril, victime de légendes erronées;  
b Tout se passe comme si, victime de légendes erronées, le Français de 1963 ignorait le péril;  
c Victime de légendes erronées, tout se passe comme si le Français de 1963 ignorait le péril;
5. a Les Français détiennent désormais le record des décès par cirrhose du foie;  
b Le Français détient désormais le record des décès par cirrhose du foie;  
c La France détient désormais le record des décès par cirrhose du foie;

(continued on next page.../)

6.
    - a Constamment, l'alcoolisme en France augmente;
    - b En France, l'alcoolisme augmente constamment;
    - c En France, l'alcoolisme est en augmentation constante;
  
  7.
    - a Ne tenant compte que de la population adulte...
    - b Si l'on ne considère que la population adulte...
    - c Si l'on examine que les adultes dans une population...
  
  8.
    - a Pour 100,000 habitants, ce nombre était, en 1938, de 38 décès a Paris;
    - b Ce nombre était de 38 décès, en 1938, pour 100,000 habitants à Paris;
    - c A Paris, et pour 100,000 habitants, ce nombre était, en 1938, de 38 décès;
  
  9.
    - a Des résultats stupéfiants ont été obtenus par un sondage récent de l'Institut Français de l'Opinion Publique;
    - b l'Institut Français de l'Opinion Publique, après un sondage récent, donne des résultats stupéfiants;
    - c Un sondage récent de l'Institut Français de l'Opinion Publique donne des résultats stupefiants;
  
  10.
    - a Plus de 40% des Français interrogés pensent que la consommation d'un litre de vin par jour n'altère en rien la santé;
    - b La consommation d'un litre de vin par jour n'altère en rien la santé, pensent plus de 40% des Français interrogés;
    - c Plus de 40% des Français interrogés pensent que la santé n'est aucunement altérée par la consommation d'un litre de vin par jour.
-



Appendix -C 1-

Le Camping

La période des vacances voit une migration de population chaque année plus importante se produire des villes vers la campagne, la mer, la montagne. Les statistiques montrent que parmi ces vacanciers qui fuient ainsi les grandes villes, un grand nombre ont choisi le camping comme forme de vacances. On estime que plus de cinq millions de Français ont logé en plein air au cours des mois de l'été dernier. Une enquête organisée du 14 juillet au 25 août dans toutes les régions de France parmi les campeurs par l'Union Interprofessionnelle de Camping. Elle a ainsi permis d'établir que le nombre des vacanciers campeurs français s'était accru de 16,6 pour cent en 1963 et que 270.000 familles campaient pour la première fois. Ces mêmes statistiques permettaient de faire une constatation intéressante quant à l'origine de ces nouveaux campeurs. Les ouvriers constituaient 28,7 pour cent du nombre total des campeurs. Les employés représentaient 24,6 pour cent, les professions libérales et les cadres atteignaient 16,1 pour cent. A quoi faut-il attribuer un tel engouement pour cette forme de vacances? Le point de vue économique joue pour une grande part. Le séjour à l'hôtel est prohibitif pour une famille de quelque importance. Le prix des locations n'a cessé de s'élever et atteint des taux astronomiques en particulier en bord de mer. A l'inverse, le camping représente une formule de vacances familiales particulièrement bon marché et le coût de l'achat du matériel nécessaire se trouve rapidement amorti. Toutefois, l'afflux cause aussi de sérieux problèmes: un nombre de plus en plus grand d'automobilistes transportent leur matériel dans leurs voitures; puis sont apparues les caravanes qui ont contribué à transformer profondément le camping traditionnel. Le problème des emplacements de camp s'est posé de façon aiguë: les terrains

(continued on next page.../)

primitifs ne convenaient plus pour recevoir cette nouvelle catégorie d'usagers qui ne se contentait pas de conditions de vie aussi sommaires. Il y a eu des abus de la part des propriétaires de terrains qui demandaient des redevances excessives et des usagers qui négligaient les règles élémentaires du savoir camper. Enfin, le 7 février 1959, un décret était pris pour fixer les droits et les devoirs de chacun en matière de camping et pour régir le fonctionnement des terrains aménagés.

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Appendix-C 3-(translation)

Camping

Holidays see a population migration becoming more important each year from the cities to the countryside, the seaside and the mountains. Statistics show that among these holiday-makers who flee large cities, great numbers opt for camping as a form of holiday. It is estimated that over 5 million French people slept out in the open during the summer months last year. A survey was carried out between July 14th and August 25th in all regions of France among campers by the Interprofessional Campers' Union. This allowed to establish that the number of holiday-makers, French campers, had increased by 16% in 1963 and that 270.000 families were camping for the first time. These same statistics also revealed an interesting fact with regard to the background of these campers: 28.7% of the total number of campers were manual labourers; 24.6% were blue collar workers; 16.1% were made up of executives and white-collar workers.

What is the reason for such enthusiasm for this type of holiday-making? Economic factors certainly play a large part. Staying in a hotel is prohibitively expensive for a large family. Rents have increased and now reach astronomical proportions especially by the seaside. On the other hand, camping represents a cheap type of holiday-making and the cost of the necessary equipment soon pays itself off. However, the increase in popularity also creates certain problems: a greater number of motorists carry their camping gear in their automobiles. Then, caravans appeared which completely transformed traditional camping. Campsites also became an acute problem: primitive campsites no longer seemed adequate for accommodating this new type of camper, no longer satisfied with such limited facilities. There were also abuses on the part of the campsite owners who overcharged as well as from campers who were not always on

(continued on next page.../)

their best camping behaviour.

Finally, on February 7th, 1959, a decree was passed in order to establish rules and regulations for each and every-one regarding camping as well as the operation of camping facilities.

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Appendix -C 5-

Le Camping

Word Recognition Test

Circle "yes" if the words below appeared in the text.

Circle "no" if the words below did not appear.

Please answer all items even if you have to guess.

NB: The items are presented in French.

hors-prix	yes	_____	no	_____
déterminer	yes	_____	no	_____
migration	yes	_____	no	_____
aigüe	yes	_____	no	_____
constituaient	yes	_____	no	_____
accroissement	yes	_____	no	_____
professions	yes	_____	no	_____
exigaiient	yes	_____	no	_____
élémentaires	yes	_____	no	_____
collets-bleus	yes	_____	no	_____
rudimentaires	yes	_____	no	_____
négligaiient	yes	_____	no	_____
inconvénients	yes	_____	no	_____
modifier	yes	_____	no	_____
terrain	yes	_____	no	_____
libérales'	yes	_____	no	_____
s'élever	yes	_____	no	_____
classique	yes	_____	no	_____

Appendix -C 6-

Le Camping

Semantic Content Recognition Test

Please circle the correct letter for each question.  
There is only one possible correct answer per question.  
If you are unsure, please guess.

NB: The items are presented in French.

1. L'enquête dans toutes les régions de France parmi les campeurs a été organisée par
  - a l'Union Internationale des Campeurs;
  - b l'Union Interprofessionnelle de Camping;
  - c le Décret International de Camping;
  - d le Décret Interprofessionnel des Campeurs;
  
2. Un décret a finalement été pris pour
  - a éliminer les abus de la part des propriétaires de terrains de camping;
  - b limiter le nombre de 'caravanes' et de voitures;
  - c aménager de nouveaux terrains de camping moins primitifs;
  - d fixer les droits et les devoirs de chacun en matière de camping et régir le fonctionnement des terrains aménagés;
  
3. L'afflux de campeurs cause aussi des problèmes tels
  - a l'accroissement de voitures et de caravanes ainsi que les terrains trop primitifs et abus des propriétaires;
  - b les taux astronomiques des prix de location;
  - c l'augmentation du nombre de voitures sur les routes;
  - d la hausse des prix du matériel de camping et des caravanes;
  
4. On peut attribuer un tel engouement pour cette forme de vacances au fait que
  - a l'automobile est plus accessible aux Français;
  - b 29 pour cent des Français préfèrent le camping à toute autre forme de vacances;
  - c le camping est une formule de vacances bon marché et le coût de l'achat du matériel est rapidement amorti;
  - d raisons a, b et c;

(continued on next page.../)

-C 7-

5. Parmi les nouveaux campeurs, le groupe le plus nombreux est celui des
    - a employés;
    - b ouvriers;
    - c professions libérales;
    - d cadres;
  
  6. En 1963, le nombre de vacanciers campeurs français s'est accru de
    - a 16,6%;
    - b 28,7%;
    - c 24,6%;
    - d 36,4%;
  
  7. Le prix des locations a atteint des taux astronomiques plus particulièrement
    - a en montagne;
    - b à la campagne;
    - c au bord de la mer;
    - d sur les terrains bien aménagés;
  
  8. Entre le 14 juillet et le 25 août, 1962, on a estimé que le nombre de Français ayant logé en plein air s'élevait à
    - a 25.000.000;
    - b 1.500.000;
    - c 10.000.000;
    - d 5.000.000;
  
  9. Le nombre de familles qui campaient pour la première fois le même été s'élevait à
    - a 365.000;
    - b 270.000;
    - c 25.000;
    - d 27.000;
  
  10. Le décret a été pris
    - a le 14 juillet, 1963;
    - b le 31 août, 1963;
    - c le 7 février, 1959;
    - d le 25 août, 1962;
-

Appendix -C 8-

Le Camping

Word Order Recognition Test

Please choose the phrase that contains the exact wording of the original.

There is only one correct answer per question.

If you are unsure, please guess.

NB: The items are presented in French.

- 
1. a Le séjour à l'hôtel, pour une famille de quelque importance, est prohibitif;  
b Pour une famille de quelque importance, le séjour à l'hôtel est prohibitif;  
c Le séjour à l'hôtel est prohibitif pour une famille de quelque importance;
  2. a Il y a eu des abus de la part des propriétaires de terrains qui demandaient des redevances excessives;  
b Certains propriétaires de terrains ont abusé en demandant des redevances excessives;  
c Il y a eu des abus de la part des propriétaires de terrains: ceux-ci demandaient des redevances excessives;
  3. a A l'inverse, le camping représente une formule de vacances familiales particulièrement bon marché;  
b Le camping, à l'inverse, représente une formule de vacances particulièrement bon marché;  
c Le camping représente une formule de vacances familiales particulièrement bon marché, à l'inverse;
  4. a ... un nombre accroissant d'automobiles transportent leur matériel dans leurs voitures;  
b ... un nombre de plus en plus grand d'automobilistes transportent leur matériel dans leurs voitures;  
c ... un nombre de plus en plus élevé d'automobilistes transportent leur matériel dans leurs voitures;
  5. a Les emplacements de camp ont posé des problèmes aigus;  
b Les emplacements de camp sont devenus des problèmes aigus;  
c Le problème des emplacements de camp s'est posé de façon aigüe;

(continued on next page.../)



6.
    - a Cette nouvelle catégorie d'usagers ne se contentait plus d'être reçue dans ces terrains primitifs;
    - b Les terrains primitifs ne convenaient plus pour recevoir cette nouvelle catégorie d'usagers;
    - c Les terrains primitifs ne convenaient plus et ne pouvaient pas recevoir cette nouvelle catégorie d'usagers;
  
  7.
    - a Ces mêmes statistiques permettaient de faire une constatation intéressante quant à l'origine de ces nouveaux campeurs;
    - b Quant à l'origine de ces nouveaux campeurs, ces mêmes statistiques permettaient de faire une constatation intéressante;
    - c Ces mêmes statistiques permettaient de faire, quant à l'origine de ces nouveaux campeurs, une constatation intéressante;
  
  8.
    - a La période de vacances voit une migration de population plus importante chaque année;
    - b Chaque année, la période de vacances voit une migration de population plus importante;
    - c La période de vacances voit une migration de population chaque année plus importante;
  
  9.
    - a Parmi ceux qui furent ainsi les grandes villes un grand nombre de vacanciers ont choisi le camping;
    - b Un grand nombre de vacanciers ont choisi le camping parmi ceux qui furent ainsi les grandes villes;
    - c Parmi ces vacanciers qui furent ainsi les grandes villes, un grand nombre ont choisi le camping;
  
  10.
    - a On estime, au cours des mois de l'été dernier que plus de 5.000.000 de Français ont logé en plein air;
    - b On estime que plus de 5.000.000 de Français ont logé en plein air au cours des mois de l'été dernier;
    - c Au cours des mois de l'été dernier, on estime que plus de 5.000.000 de Français ont logé en plein air;
-

Appendix -D 1-

Le Tunnel Sous La Manche

L'idée de réaliser un tunnel sous la Manche est loin d'être nouvelle. C'est d'abord en 1802 qu'un ingénieur des mines, Roger Mathieu, proposa à Bonaparte, alors premier consul, le projet d'un souterrain éclairé au pétrole et qu'emprunteraient des chariots tirés par des boeufs. James Fox, premier ministre britannique à qui le plan fut soumis, approuva chaleureusement. Hélas, la guerre reprit peu après entre les deux pays et le projet fut abandonné. Il y eut même un début d'exécution de 1875 à 1883, mais trop d'Anglais considéraient encore les Français comme 'l'ennemi héréditaire' et craignaient d'ouvrir une route à l'invasion. Le projet fut encore abandonné alors que plusieurs kilomètres de galeries avaient été creusés. Si l'étude de l'accroissement du trafic touristique et des échanges commerciaux montrait clairement la nécessité d'un pareil ouvrage, une très importante question se posait quant au mode de réalisation. Fallait-il jeter un pont par-dessus le Pas de Calais ou percer un tunnel par-dessous?

A la tête des pontistes se trouvait Jules Moch, ancien ministre, qui estimait le pont plus agréable, plus sûr (pas de risques d'inondations) et capable de supporter un plus gros trafic. Au contraire, Louis Armand de l'Académie Française, leader des tunnellistes, estimait le tunnel moins coûteux, plus sûr (pas de risque à cause des bateaux) et tout à fait adapté au trafic prévu pour les années à venir. Comme le montrent les décisions gouvernementales, ce sont les arguments de Monsieur Louis Armand qui ont prévalu.

Restent les problèmes techniques à résoudre. Au premier plan de ceux-ci se trouve la question de décider si le tunnel

(continued on next page.../)

sera foré sous le fond de la Manche ou bien construit à l'air libre et posé sur le fond sous-marin. Le tunnel foré a l'avantage d'être moins cher mais le tunnel immergé a le mérite d'être d'une construction plus sûre. Quand on creuse un tunnel, on est pratiquement certain d'aller au devant d'imprévus dans la structure du sol dans lequel on creuse. Au contraire, il ne peut y avoir aucune surprise avec un tunnel immergé mais le coût en est très élevé.

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Appendix -D 3-

The Channel Tunnel

The idea of building a tunnel under the Channel is far from new. It was first in 1802 that a mining engineer, Roger Mathieu, proposed to Bonaparte, who was then first consul, the project for an 'underground tunnel' which would be oil-lit and which would permit ox-drawn carts to travel through. James Fox, British Prime Minister, to whom the plan was submitted, approved wholeheartedly. Alas, war resumed shortly thereafter and the idea was shelved. Some construction had actually started between 1875 and 1883 but too many Englishmen still thought of the French as the 'hereditary enemy' and feared that this would turn into a means of invading their country. So the project was abandoned once again in spite of the fact that several kilometers of galleries had already been dug.

If a survey of increases in tourism and trade clearly warranted the need for such a construction, the main question still remained as to how to go about digging it: should one cast a bridge over the Straits of Dover or drill a tunnel underneath? At the head of the bridge faction was Jules Moch, former minister, who felt that a bridge would be more pleasant, safer, (no risk of floods) and capable of withstanding more traffic. On the other hand, Louis Armand from the Académie Française and leader of the tunnel faction, felt that the tunnel would be less costly, safer, (no risk caused by boats) and capable of withstanding more traffic in the years to come. As governments decisions show, it was Louis Armand's arguments that won the day. But there still remained some technical problems to be resolved.

The main question was that of deciding whether the tunnel

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should be bored under the Channel bed or built out in the open air and then lowered onto the sea bed. The bored tunnel has the advantage of being cheaper but the submerged tunnel has the advantage of being safer. When one digs a tunnel, one is almost certain to come up against some unforeseen problem in the earth's composition. On the other hand, there are no elements of surprise with a submerged tunnel although the cost is very high.



Appendix

Le Tunnel Sous la Manche

Word Recognition Test

Circle 'yes' if the word printed below appeared in the text.

Circle 'no' if the word did not appear in the text.

Please circle all items even if you have to guess.

NB: The items are presented in French.

- .....  
\_\_\_\_\_
- |     |               |     |       |    |       |
|-----|---------------|-----|-------|----|-------|
| 1.  | onéreux       | yes | _____ | no | _____ |
| 2.  | creuse        | yes | _____ | no | _____ |
| 3.  | techniques    | yes | _____ | no | _____ |
| 4.  | consul        | yes | _____ | no | _____ |
| 5.  | circulation   | yes | _____ | no | _____ |
| 6.  | prouvent      | yes | _____ | no | _____ |
| 7.  | illuminé      | yes | _____ | no | _____ |
| 8.  | boeufs        | yes | _____ | no | _____ |
| 9.  | suggéra       | yes | _____ | no | _____ |
| 10. | commerciaux   | yes | _____ | no | _____ |
| 11. | approuva      | yes | _____ | no | _____ |
| 12. | raisonnements | yes | _____ | no | _____ |
| 13. | chars         | yes | _____ | no | _____ |
| 14. | exécution     | yes | _____ | no | _____ |
| 15. | britannique   | yes | _____ | no | _____ |
| 16. | solide        | yes | _____ | no | _____ |
| 17. | suivraient    | yes | _____ | no | _____ |
| 18. | estimait      | yes | _____ | no | _____ |

Appendix -D 6-

Le Tunnel Sous la Manche

Semantic Content Recognition Test

Please answer the following content questions by circling the appropriate letter.

If you are unsure, please guess.

There is only one possible correct answer per question.

NB: The sentences are in French.

1. Le projet du tunnel fut abandonné
  - a à cause d'une invasion des Français;
  - b à cause de la guerre entre la France et l'Angleterre;
  - c à cause d'une inondation;
  - d à cause du prix trop élevé;
  
2. La nécessité de construire le tunnel provient
  - a de l'étude du trafic prévu pour les années à venir;
  - b des décisions gouvernementales de Louis Armand;
  - c de la mésentente entre la France et l'Angleterre;
  - d de l'accroissement du trafic touristique et des échanges commerciaux;
  
3. Parmi les deux modes de réalisation, celui qui a finalement prévalu fut
  - a celui des 'tunnellistes';
  - b celui des 'pontistes';
  - c celui de l'Académie Française;
  - d celui du Pas de Calais;
  
4. Le projet des 'tunnellistes' estimait
  - a le tunnel plus agréable, plus sûr et capable de supporter un plus gros trafic;
  - b le tunnel plus coûteux mais plus sûr (pas de risques à cause des bateaux);
  - c le tunnel moins coûteux, plus sûr et adapté au trafic prévu pour les années à venir;
  - d le tunnel plus sûr (pas de risques d'inondations) et plus agréable;
  
5. La première suggestion du tunnel fut faite par
  - a James Fox;
  - b Roger Mathieu;
  - c Jules Moch;
  - d Napoléon Bonaparte;

(continued on next page.../)

6. Les 'pontistes' estimaient le pont comme étant
    - a moins coûteux, plus sûr et adapté au trafic prévu pour les années à venir;
    - b plus coûteux mais plus sûr (pas de risques à cause des bateaux);
    - c moins coûteux mais moins sûr (à cause des risques d'inondations);
    - d plus agréable, plus sûr et capable de supporter un plus gros trafic;
  
  7. Les questions techniques à envisager comprennent
    - a si le tunnel doit être foré sous la Manche ou bien construit à l'air libre et posé sur le fond sous-marin;
    - b les structures imprévisibles du sol dans lequel l'on creuse;
    - c l'éclairage du souterrain au pétrole;
    - d les problèmes d'inondations et de trafic;
  
  8. Le tunnel foré
    - a a l'avantage d'être nettement moins cher;
    - b est une construction plus sûre;
    - c peut prévoir la structure du sol dans lequel on creuse;
    - d est plus cher mais plus sûr;
  
  9. Le projet du tunnel sous la Manche
    - a n'a jamais vraiment démarré;
    - b est presentement sous construction;
    - c a été abandonné après plusieurs kilomètres de construction;
    - d a dû être abandonné à cause des inondations;
  
  10. Le leader des 'tunnellistes' était
    - a James Fox;
    - b Jules Moch;
    - c Louis Armand;
    - d Roger Mathieu;
-



Appendix -D 8-

Le Tunnel Sous la Manche

Word Order Recognition Test

Please choose the phrase that contains the exact wording of the original.

There is only one possible correct answer per question.

If you are unsure, please guess.

NB: All sentences are presented in French.

1.   a   Hélas, la guerre reprit peu après entre les deux pays et le projet fut abandonné;  
      b   Hélas, la guerre reprit peu après entre les deux pays et on abandonna le projet;  
      c   La guerre reprit peu après entre les deux pays, hélas, et on abandonna le projet;
  
2.   a   On abandonna encore le projet alors que plusieurs kilomètres de galeries avaient déjà été creusés;  
      b   Alors que plusieurs kilomètres de galeries avaient déjà été creusés, le projet fut encore abandonné;  
      c   Le projet fut encore abandonné alors que plusieurs kilomètres de galeries avaient déjà été creusés;
  
3.   a   ... quant au mode de réalisation, une très importante question se posait;  
      b   ... une très importante question se posait quant au mode de réalisation;  
      c   ... on posait une question très importante quant au mode de réalisation;
  
4.   a   Le plan fut soumis à James Fox, premier ministre britannique et il approuva chaleureusement;  
      b   James Fox, premier ministre britannique à qui le plan fut soumis, approuva chaleureusement;  
      c   Le premier ministre britannique, James Fox, à qui le plan fut soumis, approuva chaleureusement;
  
5.   a   Fallait-il jeter un pont par-dessus le Pas de Calais?  
      b   Devait-on jeter un pont par-dessus le Pas de Calais?  
      c   Est-ce qu'il fallait jeter un pont par-dessus le Pas de Calais?

(continued on next page.../)

Appendix -D 9-

Le Tunnel Sous la Manche

Word Order Recognition Test (continued...)

6. a Les problèmes techniques restent à être résolus;  
b Il reste les problèmes techniques à résoudre;  
c Restent les problèmes techniques à résoudre;
7. a ... mais les Français étaient considérés comme 'l'ennemi héréditaire' par trop d'Anglais qui craignaient d'ouvrir une route à l'invasion;  
b ... mais trop d'Anglais considéraient les Français comme 'l'ennemi héréditaire' et craignaient d'ouvrir une route à l'invasion;  
c ... mais trop d'Anglais craignaient d'ouvrir une route à l'invasion et considéraient les Français comme 'l'ennemi héréditaire';
8. a Au contraire, Louis Armand, de l'Académie Française, leader des 'tunnellistes', estimait le tunnel moins coûteux;  
b Au contraire, le leader des 'tunnellistes', Louis Armand, de l'Académie Française, estimait le tunnel moins coûteux;  
c Le leader des 'tunnellistes', Louis Armand, de l'Académie Française, au contraire, estimait le tunnel moins coûteux;
9. a Comme le montrent les décisions gouvernementales, ce sont les arguments de M. Louis Armand qui ont prévalu;  
b Ce sont les arguments de M. Louis Armand qui ont prévalu, comme le montrent les décisions gouvernementales;  
c Les arguments qui ont prévalu, comme le montrent les décisions gouvernementales, sont celles de M. Louis Armand;
10. a De 1875 à 1883, il y eût même un début d'exécution;  
b Il y eût même, de 1875 à 1883, un début d'exécution;  
c Il y eût même un début d'exécution de 1875 à 1883.
-

Appendix -E 1-  
The Hungry Brain

The growth of the human brain during gestation is one of the earliest, most rapid and most extensive developments of the whole organism. Nerve cell proliferation is complete at birth and none of these cells are replaced thereafter. After birth, the brain continues to grow at a much faster rate than the rest of the body, so much so that by the time a child is four years old, his brain has reached 90% of its adult weight, while the rest of the body has barely made it to the 20% mark. During this critical period of rapid growth, much more than just an increase in weight is involved. The structures making up the brain undergo complex and profound changes in anatomy, chemistry and physiology. While the rate of brain growth is highest before birth, the weight of the human brain nearly triples during the first year of life. This outstanding growth rate is not shared with any other mammal. Thus the human brain is most vulnerable to inadequate nutrition during the earliest period of life. Furthermore, the entire course of human existence may be largely determined by the nutrition received during that time. The problem of providing the nutritional requirements begins shortly after conception and culminates in the development of the placenta. A malnourished mother may be unable to keep up foetal demands for essential nutrients. A growing organism is extremely sensitive to variations in nutrition: malnourished rats, for example, are permanently stunted even if they later receive an adequate diet, while overnourishment would result in permanently larger animals. In humans, it was found that malnourished mothers produced smaller and lighter placentas than adequately fed mothers. Dr. Zamenhof of U.C.L.A. first showed that depriving pregnant rats of protein resulted in a reduced number of brain cells in the offspring. This was confirmed by Dr. Winick, who made the striking observa-

tion that newborn animals from deficient placentas also had fewer brain cells. On the other hand, Dr. Zamenhof was able to raise very bright rats, animals which he calls 'rat Einsteins' by providing abundant and well-balanced food. He also found that female rats, born to malnourished mothers, could not produce adequate placentas even if they were well-nourished during their entire adult lives. Their offspring exhibited the classic evidence of malnutrition including a reduction in brain cell numbers.

Thus malnutrition, an environmental influence, can produce effects very similar to those of hereditary origin. These experiments were carried out mainly with animals rather than with human beings for obvious reasons but there is ample clinical evidence available to suggest that the conclusions are equally applicable to human children.

---

Appendix -E 3-  
The Hungry Brain  
Word Recognition Test

Please circle 'YES' if the words below appeared in the text.

Please circle 'NO' if the words did not appear in the text.

If you are unsure, please guess.

NB: The items are presented in English.

---

proliferation	yes	_____	no	_____
doubles	yes	_____	no	_____
dietetic	yes	_____	no	_____
nutrients	yes	_____	no	_____
suggest	yes	_____	no	_____
with-holding	yes	_____	no	_____
mice	yes	_____	no	_____
environmental	yes	_____	no	_____
biology	yes	_____	no	_____
supported	yes	_____	no	_____
starving	yes	_____	no	_____
inadequate	yes	_____	no	_____
culminates	yes	_____	no	_____
fertilization	yes	_____	no	_____
genetic	yes	_____	no	_____
vulnerable	yes	_____	no	_____
gestation	yes	_____	no	_____
exhibited	yes	_____	no	_____

---

Appendix -E 4-

The Hungry Brain

Semantic Content Recognition Test

Please answer the following questions by circling one letter per question;

There is only one possible answer per question.

If you are unsure, please guess:

NB: The items are in English.

---

1. During the first year of life, the weight of the human brain
  - a nearly doubles;
  - b nearly triples;
  - c reaches the 20% mark;
  - d reaches the 90% mark;
  
2. The rate of brain growth
  - a is highest before birth;
  - b is lowest during gestation;
  - c is highest after birth;
  - d is lowest after birth;
  
3. By the time a child is four years old, his brain
  - a has reached 20% of its adult weight;
  - b ceases to replace brain cells;
  - c triples in weight;
  - d has reached 90% of its adult weight;
  
4. Depriving pregnant rats of protein resulted in
  - a a reduced number of brain cells in the offspring;
  - b producing smaller and lighter placentas in the offspring;
  - c permanently stunting the offspring;
  - d reducing the number of brain cells in the pregnant rats;
  
5. Einstein-rats deserve their name because
  - a there was no reduction in their brain cell numbers;
  - b their mothers' placentas were injected with protein;
  - c their intelligence was due to abundant and well-balanced food;
  - d their offspring yielded an increased number of brain cells;

(continued on next page.../)

6. Nerve-cell proliferation is complete, in the human brain
    - a by the time a child is four years old;
    - b during gestation;
    - c at birth;
    - d by the time a child is one year old;
  
  7. It was Dr. Zamenhof of U.C.L.A. who first showed that
    - a newborn animals from deficient placentas also had fewer brain cells;
    - b depriving pregnant rats of protein resulted in a reduced number of brain cells in the offspring;
    - c the outstanding growth rate of the human brain was not shared with any other mammal;
    - d the proliferation of nerve cells in the human brain continued after birth;
  
  8. It was Dr. Winick who made the striking observation that
    - a after birth, the brain continued to grow at a much faster rate than the rest of the body;
    - b the structures making up the brain undergo complex and profound changes;
    - c depriving rats of protein resulted in a reduced number of brain cells in the offspring;
    - d newborn animals from deficient placentas also had fewer brain cells;
  
  9. In rats, the classic evidence of malnutrition is
    - a a reduction in brain-cell numbers in the offspring;
    - b the lack of protein in their systems;
    - c incomplete nerve-cell proliferation after 4 years;
    - d incomplete nerve-cell proliferation after 1 year;
  
  10. Rat-Einsteins were created by
    - a Einstein himself;
    - b Dr. Zamenhof;
    - c Dr. Winick;
    - d U.C.L.A.
-

Appendix -E 6-

The Hungry Brain

Word Order Recognition Test

Please select the phrase or portion of phrase that contains the exact wording of the original.

There is only one possible answer per question.

If you are unsure, please guess anyway.

NB: The items are presented in English.

- 
- 1    a    The growth of the human brain during gestation is one of the earliest, most rapid and most extensive developments of the whole organism;  
      b    During gestation, the growth of the human brain is one of the earliest, most rapid and most extensive developments of the whole organism;  
      c    The growth of the human brain is one of the earliest, most rapid and most extensive developments of the whole organism during gestation;
  
  - 2    a    It was found that malnourished human mothers produced smaller and lighter placentas than adequately fed mothers;  
      b    It was found that malnourished mothers in humans produced smaller and lighter placentas than adequately fed mothers;  
      c    In humans, it was found that malnourished mothers produced smaller and lighter placentas than adequately fed mothers;
  
  - 3    a    Pregnant rats deprived of protein resulted in a reduced number of brain cells in the offspring;  
      b    Depriving pregnant rats of protein resulted in a reduced number of brain cells in the offspring;  
      c    Deprivation of protein in pregnant rats resulted in a reduced number of brain cells in the offspring;
  
  - 4    a    During the earliest period of life, the human brain is most vulnerable to inadequate nutrition;  
      b    The human brain during the earliest period of life is most vulnerable to inadequate nutrition;  
      c    The human brain is most vulnerable to inadequate nutrition during the earliest period of life;
  
  - 5    a    The nutrition received during that time may largely determine the entire course of human existence;  
      b    The entire course of human existence may be largely determined by the nutrition received during that time;

(continued on next page.../)



- 5 c During that time, the nutrition received may largely determine the entire course of human existence;
- 6 a Malnourished rats are permanently stunted even if they later received an adequate diet;  
b Even if they later received an adequate diet, malnourished rats are permanently stunted;  
c Malnourished rats, even if they later received an adequate diet, are permanently stunted;
- 7 a By providing abundant and well-balanced food, Dr. Zamenhof, on the other hand, was able to raise very bright rats, animals which he calls 'rat Einsteins';  
b Dr. Zamenhof, on the other hand, was able to raise animals which he calls 'rat Einsteins', very bright rats, by providing abundant and well-balanced food;  
c On the other hand, Dr. Zamenhof was able to raise very bright rats, animals which he calls 'rat Einsteins', by providing abundant and well balanced food;
- 8 a These experiments were carried out mainly with animals, rather than human beings, for obvious reasons;  
b For obvious reasons, these experiments were carried out mainly with animals rather than with human beings;  
c These experiments, for obvious reasons, were carried out mainly with animals rather than with human beings;
- 9 a The brain has reached 90% of its adult weight by the time a child is four years old;  
b By the time a child is four years old, his brain has reached 90% of its adult weight;  
c A child is four years old by the time his brain has reached 90% of its adult weight;
- 10 a During this critical period, of rapid growth, much more than just an increase in weight is involved;  
b Much more than just an increase in weight is involved during this critical period of rapid growth;  
c This critical period of rapid growth involves much more than just an increase in weight;
-

Appendix -F 1-  
The Two Hemispheres

The left hemisphere person is someone whose right hemisphere is inoperative and whose mental activity involves only the left hemisphere. The first and most important characteristic of the left hemisphere person is that he retains the power of speech. This is hardly surprising since the faculty of speech is governed by the left hemisphere. What is surprising is the fact that such a person is more willing and ready to engage in conversation and takes the initiative in discussion. His vocabulary becomes richer and more varied and his answers more extensive and detailed. He is excessively talkative and even garrulous. At the same time he is more receptive to what other people say. In order to test speech perception, a technique known as speech audiometry is used; words are recorded on magnetic tape and are played to subjects through headphones to each ear independently. Threshold of speech awareness is measured, that is the minimum intensity of the speech signal at which a person can hear speech sounds but is unable to identify the words. The volume is then gradually increased and the subject is asked to repeat the words he hears. The left hemisphere person has a lower threshold of awareness of speech sounds. He perceives quieter speech sounds than when both his brain hemispheres are working normally. He repeats the words he hears more quickly and with far greater accuracy. If one listens attentively to the left hemisphere person, one observes that although he has become more talkative, his intonation is less expressive: it is monotonous, colourless and dull. The voice itself changes: it acquires a kind of nasal twang or becomes unnatural as though the subject were barking. This speech defect is known as dysprosody.

Unlike the left hemisphere person, the right hemisphere person has a sharply diminished capacity for speech. His vocabulary

(continued on next page.../)

is impoverished and does not include words denoting abstract concepts. He has difficulty recalling the names of objects, especially those which are infrequently used although he is able to explain the purpose of any object and demonstrate how it is used, which shows that he recognizes such objects. His comprehension of speech is poor and it is necessary to speak to him in very short and simply constructed sentences. His own speech is also made up of simple sentences and often of isolated words. The speech activity of the right hemisphere person is much reduced. He is taciturn, and instead of answering questions in words, he prefers to respond by mime and gesture. It is difficult to converse with him and he becomes silent after briefly answering one or two questions. The right hemisphere person's threshold of speech awareness of speech sounds is high. He is aware only of loud words. His voice remains the same as it was before.

---

Appendix -F 3-

The Two Hemispheres

Word Recognition Test

Please circle 'YES' if the words below appeared in the original text.

Circle 'NO' if the words did not appear.

Please answer all items even if you have to guess.

NB: The words are presented in English.

---

faculty	yes	_____	no	_____
detect	yes	_____	no	_____
diversified	yes	_____	no	_____
colourless	yes	_____	no	_____
engage	yes	_____	no	_____
lexicon	yes	_____	no	_____
repeats	yes	_____	no	_____
vague	yes	_____	no	_____
intensity	yes	_____	no	_____
remembering	yes	_____	no	_____
timbre	yes	_____	no	_____
magnetic	yes	_____	no	_____
perceives	yes	_____	no	_____
precision	yes	_____	no	_____
concepts	yes	_____	no	_____
single	yes	_____	no	_____
with-holds	yes	_____	no	_____
receptive	yes	_____	no	_____

---

Appendix -F 4-

The Two Hemispheres

Semantic Content Recognition Test

Please answer the following questions by circling one correct answer per question.

Please guess even if you are unsure.

There is only one correct answer per question.

NB: The items are presented in English.

- 1 The first and foremost important characteristic of the left hemisphere person is
  - a that his left hemisphere is inoperative;
  - b that his right hemisphere is inoperative;
  - c that he retains the power of speech;
  - d that the faculty of speech is governed by the left hemisphere;
  
- 2 In order to test speech perception, the technique employed is known as
  - a speech audiometry;
  - b speech awareness threshold;
  - c speech dysprosody;
  - d speech awareness detector;
  
- 3 Threshold of speech awareness is measured by obtaining
  - a the maximum intensity of the speech signal at which a person can hear;
  - b the level at which a person can hear speech sounds and identify the words;
  - c the level at which a person can hear speech sounds but not identify the words;
  - d the minimum intensity of the speech signal at which a person can hear speech sounds but is unable to identify the words;
  
- 4 Dysprosody is a speech defect characterized by
  - a excessive talk and garrulousness;
  - b a poor comprehension of speech;
  - c a monotonous and twangy intonation;
  - d answers by mime and gestures;

(continued on next page.../)

- 5 The right hemisphere person
- a has a richer and more diversified vocabulary;
  - b has an impoverished vocabulary and poor comprehension of speech;
  - c is more likely to suffer from dysprosody;
  - d perceives quieter speech sounds than when both brain hemispheres are working;
- 6 The faculty of speech is mainly governed by
- a the right hemisphere;
  - b the left hemisphere;
  - c both hemispheres;
  - d either hemisphere;
- 7 The right hemisphere person
- a is able to explain the purpose of objects although he has difficulty recalling their names;
  - b is unable to explain the purpose of objects because he is unable to recognize them;
  - c is able to recall the names of objects although he does not recognize them;
  - d is unable to recall the names of objects which shows that he does not recognize them;
- 8 The speech activity of the right hemisphere person is
- a located in the left hemisphere;
  - b higher than that of the left hemisphere person;
  - c acquires a nasal twang;
  - d lower than that of the left hemisphere person;
- 9 The right hemisphere person's threshold of awareness of speech sounds is
- a low;
  - b the same as the left hemisphere person's;
  - c high;
  - d inoperative;
- 10 The left hemisphere person is someone
- a whose right hemisphere is operative but whose mental activity involves only the left hemisphere;
  - b whose right hemisphere is inoperative and whose mental activity involves only the left hemisphere;
  - c whose left hemisphere is inoperative but whose mental activity involves only the left hemisphere;
  - d whose left hemisphere is inoperative but whose mental activity involves only the right hemisphere.
-

Appendix -F 6-

The Two Hemispheres

Word Order Recognition Test

Please choose the phrase or portion of phrase that contains the exact wording of the original;

There is only one correct answer per question.

Please answer all items even if you have to guess.

NB: The items are in English.

- 
- 1 a It is necessary to speak to him in simply constructed and very short sentences;  
b It is necessary to speak to him in very short and simply constructed sentences;  
c Very short and simply constructed sentences become necessary when speaking to him;
  - 2 a Often, his own speech is also made up of simple sentences and of isolated words;  
b His own speech is also made up of simple sentences and of isolated words;  
c His own speech is also made up of simple sentences and often of isolated words;
  - 3 a The speech activity of the right hemisphere person is much reduced;  
b The right hemisphere person's speech activity is greatly reduced;  
c. The right hemisphere person's speech activity is much reduced;
  - 4 a He is taciturn and prefers to respond by mime or gestures instead of answering questions in words;  
b Instead of answering questions in words, he is taciturn and prefers to respond by mime or gestures;  
c He is taciturn and instead of answering questions in words, he prefers to respond by mime or gestures;
  - 5 a He repeats the words he hears more quickly and with far greater accuracy;  
b He repeats the words he hears more accurately and with far greater speed;  
c The words he hears are repeated more quickly and with far greater accuracy;

(continued on next page.../)

- 6 a The first and most important characteristic of the left hemisphere person is that he retains the power of speech;  
b The first and most important characteristic of the left hemisphere person is his retention of the power of speech;  
c The fact that he retains the power of speech is the first and most important characteristic of the left hemisphere person;
- 7 a The left hemisphere person is someone whose mental activity involves only the left hemisphere and whose right hemisphere is inoperative;  
b The left hemisphere person is someone whose right hemisphere is inoperative and whose mental activity involves only the left hemisphere;  
c Someone whose right hemisphere is inoperative and whose mental activity involves only the left hemisphere is known as a left hemisphere person;
- 8 a This is hardly surprising since the faculty of speech is governed by the left hemisphere;  
b This is hardly surprising since the left hemisphere governs the faculty of speech;  
c Since the left hemisphere governs the faculty of speech this is hardly a surprise;
- 9 a His answers become extensive and detailed and his vocabulary richer and more varied;  
b His answers become richer and more varied and his vocabulary more extensive and detailed;  
c His vocabulary becomes richer and more varied and his answers more extensive and detailed;
- 10 a The right hemisphere person has a sharply diminished capacity for speech unlike the left hemisphere person;  
b The right hemisphere person, unlike the left hemisphere person, has a sharply diminished capacity for speech;  
c Unlike the left hemisphere person, the right hemisphere person has a sharply diminished capacity for speech.
-



Appendix -G 1-

The Split Brain

Forty years ago, the great physiologist Ivan Pavlov came to the conclusion that people could be broadly divided into two types: artists and thinkers. Neurophysiologists have recently discovered an anatomical basis for this assertion. It has been discovered in the last few years that the left hemisphere of the brain controls logical and abstract thinking. The personality and the modes of perception of an individual depend upon which of his two cerebral hemispheres is more developed, whether as a result of inherited characteristics or education. Although the human brain is of considerable size and weight, there are animals with a larger and heavier brain. The human brain is large in relative terms, in other words, the brain is heavy in relation to the overall body weight. But even in this respect, we are not superior to animals. Weight for weight, the cetacea - the family of whales, dolphins and porpoises - have even heavier brains. Scientists have long assumed that the area of the human cerebral cortex was larger than that of animals, that it contained more convolutions and that its nerve cells were more numerous and more densely distributed. However, we now know that even according to these criteria, we are inferior to those legendary creatures, the dolphins. If neither size nor weight are the distinguishing characteristics of the human brain, what makes it unique? Today, there is only one characteristic of the human brain which we can regard as unique, namely its functional asymmetry. The brain of all animals and of man himself is symmetrical. Its right and left halves are constructed identically. In animals, the right and left halves of the brain perform the same work. In man however, the right and left hemispheres have different functions and govern different types of activity. It has long been known that damage to the cerebral

(continued on next page.../)

cortex (caused by haemorrhages, traumas, tumours, etc) may result in total or partial loss of speech, a condition known as aphasia. However, hardly more than a century ago, it was proven that only damage to the left hemisphere leads to aphasia. Neurologists associate not only speech with the activity of the left hemisphere but also all the higher functions of the nervous system: the intellect and complex forms of perception and activity.

---

Appendix -G 3-

The Split Brain

Word Recognition Test

Please circle 'YES' if you think the words below appeared in the original.

Circle 'NO' if you think they did not appear.

Please answer all items even if you have to guess.

NB: The items are presented in English.

rely	yes	_____	no	_____
intellectual	yes	_____	no	_____
psychologist	yes	_____	no	_____
discovered	yes	_____	no	_____
speech	yes	_____	no	_____
biological	yes	_____	no	_____
unique	yes	_____	no	_____
assumed	yes	_____	no	_____
cortex	yes	_____	no	_____
designed	yes	_____	no	_____
haemorrhages	yes	_____	no	_____
concrete	yes	_____	no	_____
sharks	yes	_____	no	_____
dyslexia	yes	_____	no	_____
rule	yes	_____	no	_____
distributed	yes	_____	no	_____
superior	yes	_____	no	_____
lighter	yes	_____	no	_____

---

Appendix -G 4-

The Split Brain

Semantic Content Recognition Test

Please answer the following questions by circling one correct answer per question.

There is only one possible correct answer per question.

If you are unsure, please guess.

NB: The items are presented in English.

- 1 The distinguishing characteristic which makes the human brain unique is
  - a that the brain is heavy in relation to the overall body weight;
  - b that we are more intelligent than animals other than the cetacea;
  - c that the area of the human cerebral cortex is larger than that of animals;
  - d its functional asymmetry;
  
- 2 It has long been known that damage to the cerebral cortex could result on
  - a haemorrhages;
  - b tumours;
  - c aphasia;
  - d dyslexia;
  
- 3 Ivan Pavlov was a famous
  - a neurophysiologist;
  - b physiologist;
  - c psychologist;
  - d neurologist;
  
- 4 The left hemisphere of the brain controls
  - a logical and abstract thinking;
  - b logical and imaginal thinking;
  - c imaginal and abstract thinking;
  - d concrete and imaginal thinking;
  
- 5 Whereas the right hemisphere of the brain controls
  - a imaginal and abstract thinking;
  - b concrete and imaginal thinking;
  - c logical and abstract thinking;
  - d logical and imaginal thinking;

(continued on next page.../)

- 6 More than a century ago, it was found that aphasia was caused by
- a damage to the corpus callosum;
  - b damage to the right hemisphere;
  - c damage to the cerebral cortex;
  - d damage to the left hemisphere;
- 7 It was Ivan Pavlov who came to the conclusion that
- a people could be divided into artists and thinkers;
  - b the personality of an individual depends on which of the two hemispheres is more developed;
  - c the cetacea have heavier brains than humans;
  - d the left hemisphere of the brain controls concrete and imaginal thinking;
- 8 Neurologists of today associate the left hemisphere with
- a the personality and the modes of perception of an individual;
  - b artists;
  - c thinkers;
  - d speech, perception and activity;
- 9 The personality and the modes of perception of an individual depend on
- a the number of convolutions and the density of nerve cells in the human brain;
  - b which of the two cerebral hemispheres is more developed;
  - c whether he is an artist or a thinker;
  - d inherited characteristics or education;
10. Functional asymmetry means
- a that the right and left cerebral hemispheres have different functions and govern different types of activity;
  - b that the right and left halves are constructed identically;
  - c that the right and left halves perform the same work;
  - d that the right and left halves perform the same work although they are not constructed identically;
-

Appendix -G 6-

The Split Brain

Word Order Recognition Test

Please choose the phrase or portion of phrase that contains the exact wording of the original;

There is only one correct answer per question.

Please answer all questions even if you have to guess.

NB: The items are in English.

- 1    a    An anatomical basis for this assertion has recently been discovered by neurophysiologists;  
      b    Recently, neurophysiologists have discovered an anatomical basis for this assertion;  
      c    Neurophysiologists have recently discovered an anatomical basis for this assertion;
  
- 2    a    It has been discovered in the last few years that the left hemisphere of the brain controls logical and abstract thinking;  
      b    In the last few years, it has been discovered that the left hemisphere of the brain controls logical and abstract thinking;  
      c    In the last few years, it has been discovered that the left hemisphere of the brain controls abstract and logical thinking;
  
- 3    a    There is only one characteristic of the human brain which can be regarded as unique;  
      b    There is only one characteristic of the human brain which may be considered as unique;  
      c    There is only one characteristic of the human brain which we can regard as unique;
  
- 4    a    Neurologists associate not only speech but also all the higher functions of the nervous system with the activity of the left hemisphere;  
      b    Neurologists associate not only speech with the activity of the left hemisphere but also all the higher functions of the nervous system;  
      c    Neurologists associate all the higher functions of the nervous system with the activity of the left hemisphere, not only speech;
  
- 5    a    If neither size or weight are the distinguishing characteristics of the human brain, what makes it unique?

(Continued on next page.../)

- b What makes the human brain so unique if neither size or weight are the distinguishing characteristics?
  - c If neither size or weight are the distinguishing characteristics, what makes the human brain so unique?
- 6
- a In animals, the same work is performed by the right and left halves of the brain;
  - b The same work is performed by the right and left halves of the brain in animals;
  - c In animals, the right and left halves of the brain perform the same work;
- 7
- a We are inferior to the dolphins, those legendary creatures;
  - b We are inferior to those legendary creatures, the dolphins;
  - c The dolphins, those legendary creatures are superior to us;
- 8
- a Forty years ago, the great physiologist Ivan Pavlov came to the conclusion that people could be broadly divided into two types;
  - b Ivan Pavlov, the great physiologist, came to the conclusion, forty years ago, that people could be broadly divided into two types;
  - c Forty years ago, Ivan Pavlov, the great physiologist came to the conclusion that people could be broadly divided into two types;
- 9
- a The personality and the modes of perception of an individual depend on which of his two cerebral hemispheres is more developed;
  - b The modes of perception and the personality of an individual depend on which of his two cerebral hemispheres is more developed;
  - c Depending on which of his two cerebral hemispheres is more developed, the personality and the modes of perception of an individual may vary;
- 10
- a It has long been known that total or partial loss of speech may result from damage to the cerebral cortex;
  - b It has long been known that damage to the cerebral cortex may result in total or partial loss of speech;
  - c Damage to the cerebral cortex has long been known to result in total or partial loss of speech;
-

Appendix -H 1-  
La Démographie

Il a fallu au moins un million d'années pour que la population atteigne son premier milliard. Le milliard a été atteint vers 1800 et le second milliard, environ 130 ans après. Le troisième n'a demandé que trente ans et 15 ans suffiront pour le quatrième. La population mondiale s'accroît par suite d'un mouvement naturel, soit l'excès des naissances par rapport aux décès. La baisse de la mortalité s'est manifestée d'abord dans les pays développés, mais elle a aussi joué de façon spectaculaire en Afrique, en Asie, en Amérique Latine depuis une trentaine d'années. Alors que les petites familles sont devenues la règle dans les pays avancés, la natalité est demeurée forte dans les régions plus pauvres. La décennie en cours se trouve donc confrontée avec la croissance démographique la plus forte que le monde ait jamais connue. On a calculé que tous les désastres - massacres de guerres, tremblements de terre, inondations, épidémies - enregistrés depuis 1850 n'ont représenté qu'un retard d'une dizaine d'années dans la croissance. L'accroissement le plus massif pour la prochaine décennie est attendu en Asie méridionale, région où se trouve déjà près du tiers de la population mondiale. La contribution de l'Inde serait la plus importante. L'augmentation la plus importante viendrait ensuite de l'Asie orientale. De toutes les grandes régions, l'Amérique latine et l'Asie méridionale sont celles qui possèdent actuellement le rythme de croissance le plus élevé; en Amérique Latine, les taux records résultent d'une mortalité relativement faible comparée à celle des autres régions en développement. En Asie méridionale, les taux actuels très élevés reflètent surtout le haut niveau de fécondité. En Afrique, la baisse de la fécondité n'est attendue que pour plus tard. Une des grandes

(continued on next page.../)



réussites de notre civilisation est la marche régulière vers une victoire sur la maladie et la famine. Au début de ce siècle, l'espérance de vie ne dépassait pas 45 à 50 ans dans les pays avancés. Aujourd'hui, dans la plupart des pays développés, on peut espérer vivre 70 ans ou d'avantage: les chiffres tournent autour de 76 ans en Scandinavie. Mais il en existe beaucoup où les habitants ne peuvent espérer vivre plus de 50 ans, particulièrement en Afrique. Au Gabon et en Guinée, les chiffres sont respectivement de 25 et 26 ans pour les hommes. Un fait significatif doit être remarqué dans l'évolution récente de la mortalité: dans certains pays industrialisés, la mortalité se trouve à des niveaux très bas et les maladies infectieuses ont été maîtrisées. Ce sont les maladies cardio-vasculaires qui deviennent la cause de mort la plus importante.

---

Appendix -H 3-  
Demographics (Translation)

It has taken nearly 1 million years for the population to reach its first milliard. The milliard was reached around 1800 and the second about 130 years later. The third only required 30 years and 15 years will suffice for the fourth. World population increases as a result of a natural movement, that is the excess of births over deaths. The drop in mortality first came about in developed countries but also manifested itself spectacularly in Africa, Asia and Latin America during the last 30 years. While small families have become the rule in developed countries, birth rates remained high in poorer countries. The present decade is thus faced with the highest demographic increase the world has ever known. It has been calculated that disasters such as war massacres, earthquakes, floods, epidemics recorded since 1850 have only represented a ten year delay in growth. The most impressive increase for the coming decade is expected in Southern Asia where there is already one third of the world's population. India's contribution would be the most important. The next most important increase would come from Eastern Asia. Of all the large areas, Latin American and Southern Asia are the two who have the highest rate of growth presently. In Latin America, the high records result from a relatively low death rate compared to other developing countries. In Southern Asia, present high rates mostly reflect a high fertility rate. In Africa, a decrease in fertility is only expected later. One of our civilization's greatest achievements is a regular victory over sickness and famine. At the beginning of the century, life expectancy did not exceed 45 or 50 years in developed countries. Today, in most developed countries, one can

(continued on next page.../)

expect to reach 70 or more. Figure revolve around 76 in Scandinavia. But there are a lot where inhabitants cannot expect to live more than 50 years particularly in Africa. In Gabon and Guinea, figures are respectively 25 and 26 for men. One significant factor should be mentioned regarding recent evolution on mortality: in certain industrialized countries, the mortality rate is very low and infectious diseases have been mastered. It is now cardio-vascular diseases that have become the most important cause of death.

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Appendix -H 5-

La Demographie - Demographics

Word Recognition Test

Please circle 'YES' if the words listed below appeared in the original text.

Please circle 'NO' if they did not appear in the original text.

Please answer all items even if you have to guess.

NB: The items are in French.

---

se multiplie	yes	_____	no	_____
démographique	yes	_____	no	_____
statistiques	yes	_____	no	_____
occidentale	yes	_____	no	_____
retard	yes	_____	no	_____
reflètent	yes	_____	no	_____
mondiale	yes	_____	no	_____
fertilité	yes	_____	no	_____
mourir	yes	_____	no	_____
contagieuse	yes	_____	no	_____
proviennent	yes	_____	no	_____
cardiaques	yes	_____	no	_____
massacres	yes	_____	no	_____
méridionale	yes	_____	no	_____
hausse	yes	_____	no	_____
atteigne	yes	_____	no	_____
dépassait	yes	_____	no	_____

---

Appendix -H 6-

Demographics

Semantic Content Recognition Test

Please answer the following questions by circling one letter per question: there is only one correct answer per question.

Please answer all questions, even if you have to guess.

NB: The sentences are presented in French.

1. L'accroissement de population le plus massif pendant la prochaine décennie est attendu
  - a en Amérique Latine;
  - b en Asie Orientale;
  - c en Asie Méridionale;
  - d en Afrique;
  
2. Le tiers de la population mondiale se trouve
  - a en Asie Méridionale;
  - b en Amérique Latine;
  - c en Afrique;
  - d en Asie Orientale;
  
3. La population humaine a atteint son premier milliard
  - a vers 1800;
  - b vers 1930;
  - c vers 1770;
  - d vers 1815;
  
4. On a calculé que tous les désastres enregistrés depuis 1850 représentent
  - a un retard d'une centaine d'années dans la croissance;
  - b un retard d'une trentaine d'années dans la croissance;
  - c un retard d'une vingtaine d'années dans la croissance;
  - d un retard d'une dizaine d'années dans la croissance;
  
5. De toutes les grandes régions, celles qui possèdent actuellement le rythme de croissance le plus élevé sont
  - a le Gabon et la Guinée;
  - b l'Asie Méridionale et l'Amérique Latine;
  - c l'Amérique Latine et l'Asie Orientale;
  - d l'Inde et l'Amérique Latine;

(continued on next page.../)

- 6.. En Afrique, et plus particulièrement en Guinée et au Gabon,
    - a l'homme s'attend à vivre 26 ans et la femme, 25;
    - b les habitants peuvent s'attendre à vivre 50 ans;
    - c un homme peut s'attendre à vivre 26 et 25 ans, respectivement;
    - d un homme peut s'attendre à vivre 25 et 26 ans, respectivement;
  
  7. La cause de mort la plus importante
    - a sont les maladies cardio-vasculaires;
    - b sont les maladies infectieuses;
    - c sont les massacres de guerres, tremblements de terre, etc.
    - d est due à la famine;
  
  8. En Amérique Latine, les taux records de croissance résultent
    - a surtout du haut niveau de fécondité;
    - b du fait que l'Amérique Latine n'est pas un pays développé;
    - c d'une mortalité relativement faible comparée aux pays développés;
    - d du fait que les maladies infectieuses ont été maîtrisées;
  
  9. L'espérance de vie ne dépassant pas 45 à 50 ans
    - a remonte aux années 1850;
    - b n'existe plus de nos jours;
    - c existait dans les années 1900 dans les pays avancés;
    - d existe particulièrement en Amérique Latine;
  
  10. L'espérance de vie atteignant 76 ans se trouve
    - a dans les pays industrialisés où la mortalité est basse;
    - b aux Etats-Unis d'Amérique;
    - c dans la plupart des pays développés d'aujourd'hui;
    - d en Scandinavie;
-

Appendix -H 8-

Demographics

Word Order Recognition Test

Please choose the phrase or portion of phrase that contains the exact wording of the original.

Please answer all items even if you have to guess.

NB: The items are presented in French.

1. a Les taux actuels très élevés en Asie méridionale reflètent surtout le haut niveau de fécondité;  
b En Asie méridionale, les taux actuels très élevés reflètent surtout le haut niveau de fécondité;  
c Les taux actuels très élevés reflètent surtout le haut niveau de fécondité en Asie méridionale;
2. a Au début de ce siècle, l'espérance de vie ne dépassait pas 45 à 50 ans dans les pays avancés;  
b L'espérance de vie ne dépassait pas 45 à 50 ans dans les pays avancés au début de ce siècle;  
c Dans les pays avancés, l'espérance de vie ne dépassait pas 45 à 50 ans au début de ce siècle;
3. a Il a fallu, pour que la population humaine atteigne son premier milliard, au moins un million d'années;  
b Il a fallu au moins un million d'années pour que la population humaine atteigne son premier milliard;  
c Pour que la population humaine atteigne son premier milliard, il a fallu au moins un million d'années;
4. a La natalité est demeurée forte dans les régions plus pauvres alors que les petites familles sont devenues la règle dans les pays avancés;  
b Dans les régions plus pauvres, la natalité est demeurée forte, alors que les petites familles sont devenues la règle dans les pays avancés;  
c Alors que les petites familles sont devenues la règle dans les pays avancés, la natalité est demeurée forte dans les régions plus pauvres;
5. a On peut espérer vivre 70 ans ou d'avantage aujourd'hui dans la plupart des pays développés;  
b Dans la plupart des pays développés, on peut espérer vivre 70 ans ou d'avantage aujourd'hui;  
c Aujourd'hui, dans la plupart des pays développés, on peut espérer vivre 70 ans ou d'avantage;

(continued on next page.../)

6.
    - a Dans certains pays industrialisés, les maladies infectieuses ont été maîtrisées et la mortalité se trouve à des niveaux très bas;
    - b Dans certains pays industrialisés, la mortalité se trouve à des niveaux très bas et les maladies infectieuses ont été maîtrisées;
    - c Les maladies infectieuses ont été maîtrisées dans certains pays industrialisés et la mortalité se trouve à des niveaux très bas;
  
  7.
    - a L'accroissement le plus massif pour la prochaine décennie est attendu en Asie méridionale, région où se trouve déjà près du tiers de la population mondiale;
    - b L'Asie méridionale attend l'accroissement le plus massif pour la prochaine décennie, région où se trouve déjà près du tiers de la population mondiale;
    - c L'accroissement le plus massif pour la prochaine décennie est attendu dans la région où se trouve déjà près du tiers de la population mondiale, l'Asie méridionale;
  
  8.
    - a En Amérique latine, les taux records résultent d'une mortalité relativement faible comparée à celle des autres régions en développement;
    - b Les taux records résultent d'une mortalité relativement faible en Amérique latine, comparée à celle des autres régions en développement;
    - c Les taux records en Amérique latine résultent d'une mortalité relativement faible comparée à celle des autres régions en développement;
  
  9.
    - a La baisse de la fécondité n'est attendue que pour plus tard en Afrique;
    - b La baisse de la fécondité en Afrique n'est attendue que pour plus tard;
    - c En Afrique, la baisse de la fécondité n'est attendue que pour plus tard;
  
  10.
    - a De toutes les grandes régions, celles qui possèdent actuellement le rythme de croissance le plus élevé sont l'Amérique latine et l'Asie méridionale;
    - b De toutes les grandes régions, l'Amérique latine et l'Asie méridionale sont celles qui possèdent actuellement le rythme de croissance le plus élevé;
    - c L'Amérique latine et l'Asie méridionale, de toutes les grandes régions, sont celles qui possèdent actuellement le rythme de croissance le plus élevé;
-



Appendix -I 1-  
L'Autoroute

En Europe, l'autoroute est née du chômage. Dès 1924, à la sortie de Berlin, le gouvernement allemand mettait en chantier la première route à circulation rapide pour donner du pain à tous les sans-travail de l'après-guerre. En même temps, les ingénieurs mettaient au point les plans du grand axe Hambourg-Bâle, dont les premiers tronçons viennent d'être terminés près de 40 ans plus tard. En pleine crise économique, l'Allemagne avait prévu le fantastique essor de l'automobile. Hitler n'eût qu'à appliquer les plans existants. Il les poussa énergiquement à la fois pour des raisons de prestige et pour des motifs stratégiques. La stratégie se retourna contre lui lors de l'invasion de l'Allemagne. Après sa chute, il laissa 2,100 kilomètres d'autoroutes. Leurs caractéristiques étaient déjà celles des autoroutes modernes: voies uniques, points noirs supprimés. Depuis, dans tous les pays, les ingénieurs ont introduit d'importantes modifications de détail: glissières de sécurité pour empêcher les voitures de sortir de la chaussée; signalisations géantes; éloignement de tous les obstacles, en particulier les lampadaires, les piles de pont, les bornes kilométriques. On s'attache maintenant à supprimer les lignes droites pour éviter la monotonie des longs parcours et l'on fait des plantations d'arbustes sur les terre-plein central pour que les conducteurs ne soient pas éblouis par les phares des voitures arrivant en face. Ainsi jour après jour, l'autoroute devient de plus en plus rapide, de plus en plus sûre, de moins en moins fatigante. Dans les pays dotés d'autoroutes, une nouvelle civilisation est en train de naître: civilisation des loisirs et aussi du travail. La voiture y est reine et les habitants des villes peuvent enfin sortir librement de chez eux sans avoir au retour la punition de devoir faire des queues interminables. Sans risquer leur

(continued on next page..../)

vie à chaque carrefour, ils peuvent aller loin chercher le calme de la nature. Dans un rayon de 200 kilomètres autour des villes, la vie renaît dans les villages qui semblaient abandonnés. Ceux qui voyagent pour leurs affaires, les routiers, les voyageurs de commerce, les industriels, peuvent, sans perdre une seconde, vivre confortablement, sans quitter l'autoroute.

En Allemagne, il y a plus de 1,100 relais-restaurants et 29 motels.

---

Appendix -I 3-

The Motorway (translation)

In Europe, the motorway rose out of unemployment. As early as 1924, at the Berlin exit, the German government began to undertake the first rapid circulation road in order to feed the unemployed during the post-war period. At the same time, engineers were finalizing the Hamburg-Basel plans whose first segments were only completed some forty years later. During an economic crisis, Germany had foreseen the incredible automobile industry. All Hitler had to do was to apply the existing plans. He pushed them energetically for reasons of prestige and strategy. The strategy turned against him during the German invasion. After his downfall, he left 2,100 kilometers of motorway. Their characteristics already resembled those of modern motorways: one-way carriage ways (dual carriageways) and black spots were eliminated. Since then, in all countries, engineers have introduced important detail modifications: security ramps so that cars don't leave the road; huge signs; all obstacles removed especially lamp-posts, bridge piers and milestones. More and more, straight lines are done away with in order to avoid the monotony of long trips and shrubs are being planted in the central reservations so that drivers won't be blinded by the headlights of oncoming traffic. So, day by day, motorways are becoming more rapid, more safe and less and less tiring. In countries with motorways, a new civilization is emerging: a civilization of leisure and of work. The automobile reigns supreme and city-dwellers can finally leave their homes without having to face queues upon their return. Without risking their lives at each road junction, they can go far seeking nature's calm. In a 200 kilometer radius around the towns, life is reborn in villages which seemed abandoned. Those who travel for their jobs such as lorry drivers, business-salesmen, industrial salesmen, can, without wasting a second,

(continued on next page.../)

live comfortably without leaving the motorway. In Germany, there are more than 1,100 restaurants and 29 motels.

---

Appendix -I 5-

The Motorway

Word Recognition Test

Please circle 'YES' if the words below appeared in the original text and 'NO' if they did not appear.

Please answer all items even if you have to guess.

NB: The items are in French.

---

supprimer	yes	_____	no	_____
modernes	yes	_____	no	_____
chauffeurs	yes	_____	no	_____
avait pressenti	yes	_____	no	_____
essor	yes	_____	no	_____
immenses	yes	_____	no	_____
risquer	yes	_____	no	_____
panneaux	yes	_____	no	_____
mettre en oeuvre	yes	_____	no	_____
chantier	yes	_____	no	_____
déserts	yes	_____	no	_____
interminables	yes	_____	no	_____
intersection	yes	_____	no	_____
éviter	yes	_____	no	_____
on s'efforce	yes	_____	no	_____
stratégique	yes	_____	no	_____
épuisante	yes	_____	no	_____
sécurité	yes	_____	no	_____

---

Appendix -I 6-

The Motorway

Semantic Content Recognition Test

Please answer the following questions by circling one possible correct answer per question.

Please answer all items even if you have to guess.

NB: The items are presented in French.

- 
1. En 1924, la 'première route à circulation rapide' fut
    - a à la sortie de Hambourg;
    - b à la sortie de Berlin;
    - c le grand axe Hambourg-Bâle;
    - d à la sortie de Bonn;
  
  2. Les plans du grand axe Hambourg-Bâle ont été terminés
    - a en 1964;
    - b en 1974;
    - c en 1940;
    - d en 1924;
  
  3. Pour éviter la monotonie des longs parcours, les ingénieurs
    - a plantent des arbustes sur le terre-plein central;
    - b installent des glissières de sécurité et des signalisations géantes;
    - c suppriment l'éblouissement des phares des voitures arrivant en face;
    - d suppriment les lignes droites;
  
  4. En Allemagne, il y a maintenant
    - a plus de 1,100 relais et 29 motels;
    - b plus de 1,100 relais-restaurants et 29 motels;
    - c plus de 11,000 relais et 39 motels;
    - d plus de 100 relais et 19 motels;
  
  5. L'Allemagne avait prévu le fantastique essor de l'automobile
    - a en espérant réduire le chômage;
    - b en 1924;
    - c en pleine crise économique;
    - d sous Hitler;

(continued on next page.../)

6. Hitler poussa énergiquement les plans du grand axe Hambourg-Bâle
    - a pour des raisons de prestige et pour des motifs stratégiques;
    - b pour donner du pain à tous les sans-travail;
    - c pour créer la première route à circulation rapide;
    - d car il avait prévu le fantastique essor de l'automobile;
  
  7. Les caractéristiques des autoroutes modernes comprennent:
    - a des glissières de sécurité, des signalisations géantes;
    - b éloignement des obstacles, lampadaires et piles de pont;
    - c plantations d'arbustes et réduction des lignes droites;
    - d les voies uniques et les points noirs supprimés;
  
  8. Après sa chute, Hitler laissa
    - a 1,100 kilomètres d'autoroutes;
    - b 2,000 kilomètres d'autoroutes;
    - c 2,100 kilomètres d'autoroutes;
    - d 100 kilomètres d'autoroutes;
  
  9. Pour que les conducteurs ne soient pas éblouis par les phares des voitures arrivant en face, les ingénieurs
    - a suppriment les lignes droites;
    - b font des plantations d'arbustes sur les terre-plein central;
    - c installent des glissières de sécurité sur les terre-plein central;
    - d installent des signalisations géantes sur le terre-plein central;
  
  10. En Europe, l'autoroute naquit
    - a du chômage;
    - b des 1924;
    - c pour donner du pain à tous les sans-travail;
    - d à cause de la prévision de l'essor de l'automobile;
-

Appendix

The Motorway

Word Order Recognition Test

Please choose the phrase or portion of phrase that contains the exact wording of the original.

There is only one correct answer per question.

Please answer all items, even if you have to guess.

N.B.: The items are presented in French.

1.   a   Depuis, les ingénieurs ont introduit d'importantes modifications de détail dans tous les pays.  
      b   D'importantes modifications de détail ont été introduites, dans tous les pays, par les ingénieurs;  
      c   Depuis, dans tous les pays, les ingénieurs ont introduit d'importantes modifications de détail;
  
2.   a   Dans un rayon de 200 kilomètres autour des villes, la vie renaît dans les villages qui semblaient abandonnés;  
      b   La vie renaît dans les villages qui semblaient abandonnés dans un rayon de 200 kilomètres autour des villes;  
      c   Dans les villages qui semblaient abandonnés, la vie renaît dans un rayon de 200 kilomètres autour des villes;
  
3.   a   Ainsi, jour après jour, l'autoroute devient de moins en moins fatigante, de plus sûre, de plus en plus rapide.  
      b   Ainsi, jour après jour, l'autoroute devient de plus en plus rapide, de plus en plus sûre, de moins en moins fatigante;  
      c   Ainsi, jour après jour, l'autoroute devient de plus en plus sûre, de plus en plus rapide, de moins en moins fatigante.
  
4.   a   Sans avoir la punition de devoir faire des queues interminables au retour, les habitants des villes peuvent enfin sortir librement de chez eux;  
      b   Les habitants des villes peuvent enfin sortir librement de chez eux, sans avoir la punition de devoir faire des queues interminables au retour;  
      c   Les habitants des villes peuvent enfin sortir librement de chez eux sans avoir, au retour, la punition de devoir faire des queues interminables;
  
5.   a   Ceux qui voyagent pour leurs affaires, les routiers, les voyageurs de commerce, les industriels, peuvent, sans perdre une seconde, vivre confortablement sans quitter l'autoroute;

(Continued on next page.../)



5.
    - b Ceux qui voyagent pour leurs affaires, les routiers, les voyageurs de commerce, les industriels, peuvent vivre confortablement sans perdre une seconde et sans quitter l'autoroute;
    - c Ceux qui voyagent pour leurs affaires, les routiers, les industriels, les voyageurs de commerce, peuvent vivre confortablement sans quitter l'autoroute et sans perdre une seconde;
  
  6.
    - a Ils peuvent aller loin chercher le calme de la nature sans risquer leur vie à chaque carrefour;
    - b Ils peuvent chercher le calme de la nature au loin sans risquer leur vie à chaque carrefour;
    - c Sans risquer leur vie à chaque carrefour, ils peuvent aller loin chercher le calme de la nature;
  
  7.
    - a Pour éviter la monotonie des longs parcours, on s'attache maintenant à supprimer les lignes droites;
    - b On s'attache maintenant à supprimer les lignes droites pour éviter la monotonie des longs parcours;
    - c Maintenant, pour éviter la monotonie des longs parcours, on s'attache maintenant à supprimer les lignes droites;
  
  8.
    - a Il les poussa énergiquement, à la fois pour des motifs stratégiques et pour des raisons de prestige;
    - b A la fois pour des raisons de prestige et pour des motifs stratégiques, il les poussa énergiquement;
    - c Il les poussa énergiquement, à la fois pour des raisons de prestige et pour des motifs stratégiques;
  
  9.
    - a En Allemagne, il y a plus de 1,100 relais-restaurants et 29 motels;
    - b Il y a plus de 1,100 relais-restaurants et 29 motels en Allemagne;
    - c En Allemagne, il y a plus de 29 motels et 1,100 relais-restaurants;
  
  10.
    - a Hitler n'avait qu'à appliquer les plans existants;
    - b Hitler n'eut qu'à appliquer les plans existants;
    - c Hitler n'a eu qu'à appliquer les plans existants;
-

Appendix -J 1-  
Le Cannabis

Avant de croire tout ce que vous lisez sur le problème de la drogue, il faut connaître le problème des statistiques sur la consommation de la drogue. Les gouvernements fournissent de bonnes statistiques sur le commerce illicite des narcotiques mais c'est sur l'usage de la drogue qu'il y a pénurie d'information. Il y a en gros deux sources officielles: les informations et les rapports établis par les services judiciaires et les services de santé qui dépendent largement de l'état de développement des institutions médicales dans le pays considéré. Dans de nombreux pays en voie de développement, le nombre de médecins est extrêmement faible en regard de l'étendue de la population et le service de santé ne dispose pas d'une équipe suffisante pour détecter les cas et collecter les informations.

Aux Etats-Unis, selon une opinion assez répandue parmi les jeunes, la marijuana n'est pas plus nocive que l'alcool et par conséquent son usage devrait être légalisé et réglementé de la même manière que l'usage des diverses boissons alcooliques. Ce n'est que depuis 1968 que des études scientifiques approfondies sur les effets des produits du cannabis ont été enregistrées dans ce pays. Les autorités américaines affirment dans une brochure d'information destinée au grand public que si la marijuana et le haschich ne produisent pas de dépendance physique, leur usage chronique engendre une dépendance psychique. Il crée un écran artificiel et amène ainsi les consommateurs abusifs, les jeunes notamment, à éviter d'affronter les problèmes réels de la vie et à ne pas développer leurs capacités physiques et mentales.

Quant à l'escalade, l'opinion générale est que la marijuana ne produit pas par elle-même le besoin d'utiliser d'autres drogues. Mais les enquêtes menées par l'Institut national américain de santé mentale indiquent que les utilisateurs intensifs de

(continued on next page.../)

marijuana ont effectivement tendance à faire l'expérience d'autres substances, le plus souvent de haschich, ensuite d'hallucinogènes forts, d'amphétamines et occasionnellement des barbituriques. Un petit nombre passe à l'opium ou à l'héroïne. Une enquête menée dans un collège américain a montré que parmi les gros fumeurs de marijuana, 1% sont devenus heroinomanes. Toutefois, d'autres enquêtes menées en California, auprès de personnes arrêtées pour usage de marijuana, ont relevé un taux d'heroinomanes beaucoup plus élevé, allant de 13 à 22%. D'autre part, des enquêtes menées parmi les heroinomanes ont montré que 85% des personnes examinées avaient au début essayé la marijuana. De plus, certains juristes considèrent que le taux de criminalité est plus élevé parmi les personnes consommant beaucoup de marijuana.

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-J 3-

Appendix  
Cannabis (translation)

Before believing everything you read on the drug problem, one has to understand the statistics problem on drug consumption. Governments issue good statistics on illicit narcotics sales but it is on drug use that information is lacking. There are two official sources: news and reports established by judicial services and health services which depend largely on the state of development of medical institutions in a given country. In many developing countries, the number of doctors is extremely low compared with the population. Health services don't have a large enough team to detect all the cases and gather the information. In the United States of America, according to widespread opinion among young people, marijuana is no more dangerous than alcohol and as a consequence, its usage should be regulated in the same manner as alcoholic beverages. It is only since 1968 that in-depth scientific studies on the effects of cannabis have begun in this country. The United States authorities claim in an information pamphlet geared for the public that if marijuana and haschich do not cause physical addiction, their chronic usage causes psychological addiction. It creates an artificial screen and leads intensive users - mostly young people - to avoid facing life's real problems and to not develop their physical and mental capabilities.

With regards to going on to harder drugs, the general opinion is that marijuana on its own does not lead to other drugs. But, according to studies carried out by the United States Institute of Mental Health, heavy marijuana users have in fact a tendency to try other drugs most often haschich, followed by hallucinogens, amphetamines and occasionally bar-

(continued on next page.../)

biturates. A small number go on to opium or heroin

A study done in an american college revealed that among heavy marijuana smokers, 1% became heroin addicts. However, other studies undertaken in California among people arrested for having used marijuana showed a much higher rate of heroin addicts, ranging from 13% to 22%. Furthermore, studies carried out among heroin addicts showed that 85% of those examined had started off on marijuana. In addition, legal authorities find that the crime rate is much higher among those who take marijuana.

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Appendix -J 5-

Le Cannabis - Cannabis

Word Recognition Test

Please circle 'YES' if the words below appeared in the original

Please circle 'NO' if they did not appear.

Please answer all items even if you have to guess.

NB: The items are presented in French.

---

opium	yes	_____	no	_____
recueillir	yes	_____	no	_____
population	yes	_____	no	_____
chronique	yes	_____	no	_____
éviter	yes	_____	no	_____
escalation	yes	_____	no	_____
néfaste	yes	_____	no	_____
faire face à	yes	_____	no	_____
fumeurs	yes	_____	no	_____
abusifs	yes	_____	no	_____
diffusent	yes	_____	no	_____
artificiel	yes	_____	no	_____
université	yes	_____	no	_____
biologique	yes	_____	no	_____
juristes	yes	_____	no	_____
collecter	yes	_____	no	_____
illégal	yes	_____	no	_____
utiliser	yes	_____	no	_____

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Appendix -J 6-

Cannabis

Semantic Recognition Test (Content)

Please answer the following questions by circling one letter per question.

Please answer all questions even if you have to guess.

NB: The items are in French.

1. Des enquêtes menées parmi des héroïnomanes ont montré que
  - a 1% avaient été des gros fumeurs de marijuana;
  - b le taux de criminalité était plus élevé parmi eux;
  - c 85% des personnes examinées avaient au début essayé la marijuana;
  - d un taux allant de 13 à 22% avaient été arrêtés en Californie;
  
2. Il semble y avoir pénurie d'information
  - a sur l'usage de la drogue;
  - b sur le commerce illicite des narcotiques;
  - c parmi les équipes de services de santé dans les pays;
  - d dans les institutions médicales dans certains pays;
  
3. Quant aux statistiques sur la drogue, les deux grandes sources officielles sont:
  - a les rapports établis par les services judiciaires et les services de santé;
  - b les gouvernements et les informations;
  - c les services judiciaires et les informations;
  - d les informations et les rapports établis par les services judiciaires et les services de santé;
  
4. Dans une brochure d'information, les autorités américaines affirment que
  - a la marijuana n'est pas plus nocive que l'alcool;
  - b l'usage chronique de la marijuana engendre une dépendance psychologique;
  - c l'usage de la marijuana va être légalisé de la même manière que l'usage des diverses boissons;
  - d que la marijuana ne produit pas par elle-même le besoin d'utiliser d'autres drogues;

5. L'Institut national américain de santé mentale indique que les utilisateurs intensifs de marijuana ont tendance à
    - a éviter d'affronter les problèmes réels de la vie;
    - b ne pas développer leurs capacités physiques et mentales;
    - c passer à l'opium ou à l'heroine;
    - d faire l'expérience d'autres substances;
  
  6. Selon certaines enquêtes menées en Californie auprès de personnes arrêtées pour usage de marijuana,
    - a 1% seraient devenus héroïnomanes;
    - b 85% étaient passés à l'heroine;
    - c le taux d'héroïnomanes s'élevait de 13 à 22%;
    - d un petit nombre était passé à l'opium ou à l'heroine;
  
  7. Selon l'Institut national américain de santé mentale, les utilisateurs intensifs de marijuana font l'expérience d'autres substances
    - a le plus souvent d'amphétamines;
    - b le plus souvent du haschich;
    - c le plus souvent des hallucinogènes forts;
    - d le plus souvent des barbituriques;
  
  8. Certains juristes considèrent que
    - a la marijuana et l'alcool devraient être réglementés et légalisés de la même manière;
    - b le taux de criminalité est plus élevé parmi les gens consommant beaucoup de marijuana;
    - c la marijuana ne produit pas par elle-même le besoin d'utiliser d'autres drogues;
    - d les usagers abusifs de la marijuana étaient plus particulièrement les jeunes;
  
  9. Les statistiques provenant de sources officielles dépendent largement
    - a des rapports établis par les services de santé;
    - b des rapports établis par les services judiciaires;
    - c de l'état de développement des institutions médicales;
    - d du nombre de médecins par rapport à la population;
  
  10. Dans de nombreux pays en voie de développement
    - a le nombre restreint de médecins et une équipe insuffisante pour détecter les cas expliquent la pénurie d'information;
    - b les rapports établis entre les services judiciaires et les services de santé sont moins officiels;
    - c les institutions médicales sont moins développées;
    - d le commerce des narcotiques est licite;
-



Appendix -J 8-

Cannabis

Word Order Recognition Test

Please circle the one sentence, in each question, which is the exact wording that you heard in the original.

Please answer all questions, even if you have to guess.

N.B.: The items are presented in French.

- 1 a Aux Etats-Unis, selon une opinion assez répandue parmi les jeunes, la marijuana n'est pas plus nocive que l'alcool;  
b Selon une opinion assez répandue aux Etats-Unis parmi les jeunes, la marijuana n'est pas plus nocive que l'alcool;  
c Selon une opinion assez répandue parmi les jeunes aux Etats-Unis, la marijuana n'est pas plus nocive que l'alcool;
- 2 a Ce n'est que depuis 1968 que des études approfondies et scientifiques ont été entreprises dans ce pays sur les effets des produits du cannabis;  
b Des études scientifiques approfondies sur les effets des produits du cannabis ont été entreprises dans ce pays depuis 1968;  
c Ce n'est que depuis 1968 que des études scientifiques approfondies sur les effets des produits du cannabis ont été entreprises dans ce pays;
- 3 a Le nombre de médecins est extrêmement faible en regard de l'étendue de la population;  
b En regard de l'étendue de la population, le nombre de médecins est extrêmement faible;  
c Le nombre de médecins, en regard de l'étendue de la population, est extrêmement faible;
- 4 a Le service de santé ne dispose pas d'une équipe suffisante pour collecter les informations et détecter les cas;  
b Le service de santé ne dispose pas d'une équipe suffisante pour détecter les cas et collecter les informations;  
c Pour collecter les informations et détecter les cas, le service de santé ne dispose pas d'une équipe suffisante;
- 5 a Il amène ainsi les consommateurs abusifs, les jeunes notamment, à éviter les problèmes réels de la vie et à ne pas développer leurs capacités physiques et mentales;

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- b Il amène ainsi les consommateurs abusifs, les jeunes notamment, à ne pas développer leurs capacités physiques et mentales et à éviter d'affronter les problèmes réels de la vie;
  - c Les consommateurs abusifs, les jeunes notamment, sont ainsi amenés à éviter d'affronter les problèmes réels de la vie et à ne pas développer leurs capacités physiques et mentales;
- 6.
- a Une enquête menée dans un collège américain a montré que 1% parmi les gros fumeurs de marijuana sont devenus héroïnomanes;
  - b Une enquête a montré que parmi les gros fumeurs de marijuana dans un collège américain, 1% sont devenus héroïnomanes;
  - c Une enquête menée dans un collège américain a montré que parmi les gros fumeurs de marijuana, 1% sont devenus héroïnomanes;
- 7
- a Toutefois, d'autres enquêtes menées auprès de personnes arrêtées en Californie pour usage de marijuana, ont relevé un taux d'héroïnomanes beaucoup plus élevé;
  - b Toutefois d'autres enquêtes menées en Californie auprès de personnes arrêtées pour usage de marijuana ont relevé un taux d'héroïnomanes beaucoup plus élevé;
  - c Toutefois d'autres enquêtes menées en Californie ont relevé un taux d'héroïnomanes beaucoup plus élevé auprès de personnes arrêtées pour usage de marijuana;
- 8
- a L'opinion générale est que, par elle-même, la marijuana ne produit pas le besoin d'utiliser d'autres drogues;
  - b L'opinion générale est que la marijuana ne produit pas, par elle-même, le besoin d'utiliser d'autres drogues;
  - c L'opinion générale est que la marijuana, par elle-même, ne produit pas le besoin d'utiliser d'autres drogues;
- 9
- a Il faut connaître le problème des statistiques sur la consommation de la drogue avant de croire tout ce que vous lisez sur le problème de la drogue;
  - b Avant de croire tout ce que vous lisez sur le problème de la drogue, il faut connaître le problème de la consommation de la drogue et des statistiques;
  - c Avant de croire tout ce que vous lisez sur le problème de la drogue, il faut connaître le problème des statistiques sur la consommation de la drogue;
- 10
- a Les gouvernements fournissent de bonnes statistiques sur le commerce illicite des narcotiques mais c'est sur l'usage de la drogue qu'il y a pénurie d'information;
  - b Sur le commerce illicite des narcotiques, les gouvernements fournissent de bonnes statistiques, mais c'est sur l'usage de la drogue qu'il y a pénurie d'information;
  - c Il y a pénurie d'information sur l'usage de la drogue mais les gouvernements fournissent de bonnes statistiques sur le commerce illicite des narcotiques;
-

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