THE SAMENESS OF REAL AND IMAGINED MEMORIES

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CHAPTER I

THE SAMENESS HYPOTHESIS

Real-Imagined Memory Confusion

In most instances in everyday life, when an individual recalls a given event, he has no doubt as to whether the event actually happened or was imagined. Real events of the previous day are readily distinguished from dreams of the previous night. A remembered childhood fantasy of being a great baseball star is realized clearly to be a fantasy while another memory of an early trip to a baseball game is known to have actually occurred. Yet despite the usual ease and certainty with which real and imagined events are differentiated in memory, there are instances where errors and uncertainties do occur. There are instances where the real-imagined valence of a given event can shift completely in memory or where an individual finds himself uncertain as to whether a given event actually happened or was imagined. The fact that these instances can and do occur is the main concern of this research. More specifically, the confusion dealt with here will refer to the recall of either real or imagined events. (An imagined event will be defined here as the occurrence of a mental representation of anything not

actually present to the senses.) In these cases, though the content of such an event may be remembered accurately, the fact of whether the event actually happened or was imagined is either forgotten or confused.

In order to further clarify what is meant here by the real-imagined memory confusion some possible examples will be cited. One example is a remembered dream fragment about which an individual is uncertain as to whether or not it was dreamt or real. Another example is an individual's memory of having said some words to another person, which, in reality, the individual only thought about saying. A final example, perhaps the most common, is the mistaking of a childhood fantasy for a childhood event.

This kind of real-imagined memory confusion must be differentiated here from another similar but distinctly different kind of real-imagined memory confusion. The other real-imagined memory confusion which will be referred to here as a "false memory," occurs where an individual, in trying to remember an event, substitutes a false memory, a non-veridical reproduction of the given event being recalled, for the real event. Here the false memory is not a memory of a fantasied event, but rather a fantasy created at the time of recall as a substitute for a forgotten event and is mistaken for a memory of the real event. The difference between the two can perhaps best be illustrated by an example. A witness in a courtroom, when asked to

remember certain details of an event, consciously falsifies some of the details. Here he is consciously creating a fantasy and no memory confusion of any kind exists. If, however, in later recalling the event he either believes or is unsure that the courtroom falsified details are not what actually occurred, then this becomes an example of the kind of real-imagined memory confusion to be dealt with in this paper, for in this case he has confused the memory of a fantasy with the memory of a real event.

On the other hand, if in first testifying, the witness made errors in reporting the details of the original event but was unaware that these were errors, this would be an example of the false memory phenomenon. In this instance he would be substituting for the original details not the memory of a fantasy, but a fantasy first occurring at the time of recall. Further there is no awareness that this fantasy first created at that moment is anything but a true memory of an event. The difference between these two kinds of memory confusion is then that with the former, the confusion is between the memory of events that occurred either in actuality or in fantasy at some past time, where the confusion is solely with regard to whether these events were real or fantasy. With the latter, the false memory phenomenon, the confusion is between a fantasy, not a memory of a fantasy, and a memory of an actual event. In short, though the false memory phenomenon is related to the real-imagined

memory confusion, it is distinctly separate and it is the former which will be dealt with here.

The main source that has previously dealt with the confusion of the memories of real and imagined events is the psychoanalytic literature. Freud (1896, 1897, 1898, 1900), in his early work was forced to deal with this specific issue which had a profound influence on the course of his theory. Because he found hysterical patients invariably relating to him tales of seduction in their childhood, he had come to believe that the etiology of hysteria lay in these childhood seductions. However, in time he came to doubt the veracity of these stories, ultimately concluding that the seductions were not fact but fantasy. "Hysterical symptoms are not attached to actual memories, but to phantasies erected on the basis of memory (p. 491, 1900)."

As to how it was possible that patients could mistake fantasy for reality, Freud was not so much concerned with the mechanics of the conscious mistake as with the influence that such a mistake could have. This he layed to the characteristics of the unconscious, ". . . there is no 'indication of reality' in the unconscious so that it is impossible to distinguish truth from emotionally charged fiction (Letter to Fliess, September 21, 1897)." While this affords an explanation of how fantasy can influence as reality, it does not specifically explain how the error can take place consciously. Perhaps it was so because for Freud

it was the unconscious which had to be understood in order to understand behavior.

Another example of confusion of actual and imagined memories was dealt with by Freud (1913) in a paper on treatment. In it he wrote of a patient who in therapy claimed to have previously related material which was in fact being brought up for the first time. Freud said that the patient, ". . . confounded a recollection of his intention with a recollection of its performance (p. 335)." In this paper, however, Freud's main concern is with the unconscious motivation behind this error and he does not take up the issue of the confusion of intended with actually said as a specific phenomenon of memory in need of further explanation. Again we are to assume that it is the non-differentiation in the unconscious which is the basic root of this confusion.

The Concept of Sameness

The major aim of this paper will be to gain some understanding of just how it is possible for the real-imagined memory confusion to take place. It will attempt to do so by establishing one general concept which can hopefully be used as a basis for understanding how the memory confusion between real and imagined events is possible. This concept is that in some basic way the memories of real and imagined events are the same. That is, that the memories at some basic

level in storage in the brain lack the distinction between real and imagined. Further that the conscious distinction of actual from imagined in memory is based on a learned ability to distinguish the usual characteristics of an actual memory from those of an imagined one. What is meant more specifically by this concept of sameness will be gone into shortly.

Though this thesis will concern itself more with the fact of sameness and its implications than with the process by which real and imagined are in fact differentiated, an elaboration of what is meant by the usual characteristics of real and imagined memories will be presented. It is these characteristics which are seen here as enabling the differentiation between the two to be made.

The concept of usual characteristics is based on the idea that most memories of events have either as part of them or connected in association with them certain elements which are, as a rule, peculiar either to real or imagined events but not to both. That is, most memories of real events possess at least one of a number of characteristics that are possessed only by real memories. The same applies to memories of imagined events which usually have at least one of a number of possible characteristics that are usually exclusive to memories of imagined events. These are in a sense signal characteristics in that if a given memory possesses one or more of these either imagined or real

signal characteristics, but not both at the same time, then the real-imagined memory differentiation will be made on the basis of whether the signal characteristics present are those identified with real or imagined. This identification is based on the individual's having previously learned that these characteristics are reliable bases for the real-imagined differentiation. If these characteristics are lacking from a memory or if real and imagined signal characteristics are both present at the same time, then it would follow that the differentiation becomes either difficult or impossible. Also, if the signal characteristics are present in a given memory such that they contradict the reality of whether the memory in question was actually real or imagined, then the judgement as to whether the memory was real or imagined will be in error following the sign of the characteristics, rather than what actually was the case.

Though there will be no attempt here to indicate all of these signal characteristics, examples will be offered here as to what many of these signal characteristics may be. Examples of characteristics which, when existing as part of or connected with a given remembered event, would tend to identify the event as imagined would be first, if the remembered event is highly improbable such as a memory of jumping off a high bridge, or seeing a herd of elephants in the backyard. Such memories would be readily identifiable as fantasy simply because of their improbability. The

exception would be where the given memory was connected with many other corroborating memories such as to make the memory believable. Such memories would be: having heard the news that herd of elephants had escaped from a nearby travelling circus, having seen the backyard badly trampled, and having remembered all the events surrounding the excitement of having elephants in the backyard. Further, all of these memories must be readily placed in the context of a specific time period in the individual's life.

A second characteristic would be if the remembered event is connected with a large quantity of other memories whose content indicates that the first memory could not have happened. An example would be a memory of being told by the boss as a meeting of getting a raise in pay but having a larger conflicting group of memories such as a recent meeting with the boss where nothing happened, getting the same paycheck as usual, or discussing the previous night with a friend how it would be nice to get a raise. In this case in the context of the larger bulk of conflicting memories, the memory of being given a raise makes no sense and can be labelled a fantasy.

A third imagined signal characteristic would be where a remembered event is completely isolated from other memories such that it cannot be placed in any context. It is impossible to remember when it occurred, or to remember either the events that led up to it or followed it either

casually or in a time sequence. An example of this would be a dream fragment about a fairly everyday occurrence which when recalled is nonetheless readily recognized as a dream simply because there are no other memories which can be recalled to tie it into the context of the previous day or days. Since all old memories tend to be isolated in this way, it is not surprising that more uncertainty exists with regard to older memories as to whether they happened or not.

Examples of memory characteristics which would tend to identify events as having actually happened would be first if a given remembered event is quite plausible in the context of the individual's life. That is, the memory seems quite ordinary. Hence a specific childhood memory of walking to school and joining a friend on the way, even if a memory of a fantasy, would probably never be questioned as anything but real simply because there would be no reason to assume it was not. The exception to this would be where other conflicting facts or events were recalled, such as the friend in question not living on the way to school. Consequently, a second characteristic is when a memory, given that it is plausible and has no other memories connected with it which contradict the possibility of its actual occurrence, will be assumed real.

Thirdly, a memory will be deemed real if it can be placed in a context with other memories which are themselves

judged real. In this respect the ultimate judgement of realness would rely on whether a memory can be placed in the context of the bulk of all memories which comprise the category, "That of my life which is real." If this condition is fulfilled then it is possible for even a highly improbable memory to be labelled real. For example, with the elephants in the backyard, if all the related events surrounding it which relate to the larger context of the individual's life are recalled, then the memory of elephants in the backyard will be judged real. Still there might remain some doubt as to the veridicality of even the whole group of concurring memories, perhaps causing the individual the day after the incident to check out the window in order to see the trampled backyard just to verify that the incident really did occur. He would do this, despite all the corroborating memories, simply because his training is such that he must believe all memories which seem improbable to be imagined.

Finally a last identifying memory characteristic will be mentioned which can be used to identify a given remembered event either as real or imagined. This is when a label is attached in association to a given memory. For example, "I imagined this," or "I said this," or any such lable would identify a given memory as either real or imagined, and the real-imagined differentiation can be made simply on the basis of this label. The label would be the memory of a

separate event which comes up connected with the event in question. This separate event would be the actual thinking, saying or hearing that the original event was real or imagined. An example of this is a dream of visiting an often visited friend. When recalled the following morning, it is clearly seen as a dream and labelled as such because it is easily remembered that no such visit took place over the last few days. If the dream is recalled months later without a remembrance of the morning labelling, there could conceivably be nothing else to differentiate the remembered dream from fact. The dream would be taken for real.

This thesis will not elaborate further on these different signal characteristics. They are not presented here in an attempt to give definitive statement about the form that they take. Rather, they are presented to illustrate the kind of indicators that can be postulated to exist to allow for a theory of real-imagined memory differentiation. The theory eliminates the need for a concept that reality is an intrinsic part of every memory as it resides in storage. What will ultimately be demonstrated here are instances where the real-imagined memory differentiation is based on just these kinds of signal characteristics, though not necessarily the same ones as specifically enumerated above. However, similar to the above specified characteristics, these will be ones whose identification as real or imagined can clearly be seen as a product of learning.

The above hypothesis implies that the perception of whether a given remembered event actually occurred or was imagined, is a judgement made at the time of recall unrelated to any intrinsic realness or imaginedness of the specific memory. One aspect of this hypothesis is that it goes directly against the perceptions of everyday experience where, as a rule, individuals perceive specific remembered events to be real as opposed to being judged real. Nonetheless, this idea that the feeling of realness about a memory is attributable to something other than the intrinsic realness of the event itself, is not altogether new. Lewin (1939) and Kris (1956) wrote of the sense of conviction that they found to be connected with childhood memories which were reconstructed in the course of analysis. This conviction, for Kris "the sense of the real," was felt to be a function of the lifting of repression connected with a given memory. The infantile sense of omniscience, originally connected with the memory, was then once again awakened. Lewin called the omniscience "a child's narcissistic birthright." For both Lewin and Kris, the sense of reality in omniscience is not part of a given memory, but connected with it.

Freud (1937) with regard to analytic reconstructions wrote, "We produce in him (the patient) an assured conviction of the truth of the construction which achieves the same therapeutic result as a recaptured memory p. 266."

Here Freud implies that a feeling of conviction, a feeling that a given event occurred, can in fact be produced wholly separate from a conscious reproduction of a past event. Though this is not exactly a sense of realness, it is a feeling about a memory's veridicality produced by a conscious judgement based on evidence.

The concept of reality presented here is perhaps closest to that implied by Tomkins (1962). He saw all perceptions not as representations of reality, but as internally produced imagery in response to external stimuli. As all perception, including remembering, is imagery, there then can be no actual reality in the brain.

If, however, one is going to postulate that the reality of a conscious memory is not the reality of the external world, there is still some indication of reality in the brain. To try to understand what psychic reality may be, as well as to further explore the concept of sameness put forward above, requires a deeper discussion of the structure of memory and the process of remembering.

Memory as Reconstruction

The judgement of whether a given memory is real or imagined is based on evidence available specifically at the time of recall. Remembering, then, is regarded as a process of reconstruction rather than an activation of a whole

memory. The concept of reconstruction in psychoanalysis is crucial to the recovery of childhood memories. Freud (1937) viewed the reconstruction, at least therapeutically, as equal to the actual recall of a memory. Kris (1956) similarly speaks of the reconstructive nature of childhood memories recovered in analysis where the memories are based mainly on inferences from the present. Here he implies that the present, rather than a record of what went on at the time of a remembered event's occurrence, is crucial to memory. Implicit in this psychoanalytic view is the idea that to the individual it really does not matter what actually happened, only what is reconstructed to have happened.

In the psychoanalytic view, a reconstruction is seen mainly as a conscious deduction based on conscious evidence as to what happened. However, the reconstructed reality dealt with in this thesis refers more to psychic events that take place prior to the point where a given memory reaches consciousness. Realness is seen here as becoming attached to a given memory prior to a coming to consciousness of any elements of the memory. Memory reconstruction becomes a process whereby the memory of a given event, as it is recalled, picks up attributes as it comes to consciousness that it does not possess at its most basic level of storage. It is then a putting together, a synthesis, of perhaps very different kinds of memory storage structures in the brain.

One such structure would have to be the source of the judgement reality. A second would have to correspond to a record in some form of the given event. As to the actual nature of such hypothetical structures, it becomes necessary to enter into a discussion of the concepts of trace and schema. In the discussion which will follow, the aim will be to bring out conceptions of trace and schema which will be able to serve as a model to fill the basic needs of the major hypothesis of this research. If the conscious reality of a memory is not a part of that same memory at its most basic level of storage, it must then be postulated that two wholly separate structures exist. One such structure is for "reality" and the other for some kind of basic record of the event.

Trace and Schema

The concepts of memory trace and schema have evolved in order to explain the mechanism of memory storage where they both have been utilized as the actual repositories of memory. In the past these terms have not always been kept separate. They have existed as systems seen to eliminate the need for each other, as integrated parts of single systems and as interchangeable terms.

The concept of a memory trace is the product of certainly the most basic conception of memory storage, a simple record of an event stored veridically and completely in the brain. Perhaps the prototype of the trace was suggested by

Penfield's (1952) findings when he found that electrical stimulation of specific locations in the temporal lobes of patients produced specific memories which seemed to correspond to each different area stimulated. In his article on current schema theory, Paul (1967) gives a general definition of the memory trace. A trace, he writes, is created when, "an experience generates a replica of itself. Whatever the form of the relationship between the event and its trace carry-over, the trace functions so that the recall can in principle be fully veridical with respect to the past event and to the way it was experienced."

Paul's is the basic definition of trace which will be used here with one modification: the trace will be seen as a record of an event, only to the extent of what is recorded in it. That is, the trace need not be seen as a full record of an event, only an accurate one. Also, the trace need not be in the form that the event actually occurred, it may be coded. The trace is a faithful record of the event to the extent of what is recorded, meaning that conceivably there are aspects of the event which the trace cannot or does not make a record of.

The concept of schema is considerably more complex than the trace. The schema in fact grew out of a failure of any conception which relied wholly on the trace to explain all memory phenomena. The most notable failure was perhaps the inability of a purely trace conception to adequately explain

the fact that memories do differ from the events that they represent. Bartlett's work was perhaps most significant in originally advancing schema theory. Bartlett (1932) saw memory as more than simply a replay of a stored replica of an original event. He was able to demonstrate that the final product of remembering is basically a reconstruction. He saw the original event as a base acted upon by the current learning sets of the individual such that what is consciously remembered is made to fit with these sets, often at the expense of veridical recall. Hence since what is remembered is effected by learned sets, learning, the whole history of the individual, was seen by Bartlett as going into what is remembered in any given instance. This for Bartlett was the schema, a memory structure which was a reflection of the stimulation of the sum total of the individual's entire psychic history, a structure which he saw as eliminating any need for a trace conception.

Bartlett's choice to emphasize memory distortions as the key to understanding the memory process gave a new direction to memory theory. Freud (1900) in his discussion of memory had seen memory distortion as the result of unconscious demands exerted to change what basically started as a veridical trace. Consequently Freud never gave the source of the memory distortions the status of being a basic part of the memory system. Subsequent theorists following Bartlett's lead did begin to look at memory dis-

tortions in this way. In general their aims with regard to the schema concept were similar. This was to account for the something in the present of the individual which appeared as part of conscious memories but was not part of the original events being remembered. This something was embodied in the schema.

In somewhat of an oversimplification, schema theories after Bartlett have varied between two types. One type tends to view the schema as a more general, larger entity where it is seen as representing an overall plan of doing things. It is seen as a personality pattern, a way of organizing thought and behavior. The other type tends to view schema as far more specific, more in terms of specific concepts rather than overall ways of viewing. In short the differences become one of size, how much is encompassed by an individual schema. Further, the systems with the more general schemata tend to view the schemata as organizations where recourse to smaller units is necessitated. The schemata become trace organizations. Paul criticizes many of the schema conceptions on just these grounds: they, as trace organizations, do not elevate the schema to something truly different from the trace. This is not the case with the theories which portray the schema as more specific and concept-like.

In discussing Bartlett's conceptions of schema, Northway (1931) simultaneously rejects many of the specifics of his

theory, but accepts and tries to follow its general trend. She emphasizes the schema as "what the subject makes (p. 34)." Here she follows the main flow of Bartlett's experiments which, if anything, stressed what the individual brings to the act of remembering as the key to what is remembered. For Northway the schema is a process, a basically everchanging way of organizing stimuli. In her accent on process she aims to view the schema not as a unit or entity, but as a way. Northway's emphasis on ways is in part an attempt to avoid a conception of schema which gives it a specific structure. As such, schemata must consequently become organizations, patterns or networks of traces just in order to postulate some memory structures in the brain.

Vernon (1955) pointing to the different ways individuals perceive different stimuli, speaks of schemata as modes of perceiving built up through individual experience. In her attempt to postulate the structural form of such schemata, she refers to Oldfield (1954) who, seeking an alternate to traces, proposed a conception of schemata as being similar to the circuital storage devices in computers. However, even here, Vernon's recourse to Oldfield does not really propose an alternate to trace, but rather a more sophisticated trace and trace organization. This conception only serves to accentuate the problem for so many theories of creating a truly untracelike schema, for where the schema is seen ar a way of organizing stimuli, it is forced to be some kind of

organization of traces.

This is basically the problem for Klien and Holt (1960) who view schemata primarily in the role of giving meaning to stimuli. For them schemata are basically trace organizations. What is striking in their discussion of schemata is their use of the phrase "idea-traces (p. 86)." Though they do not elaborate upon these "idea-traces," there is in the phrase the connotation of a rather untracelike entity which is perhaps more similar to the schema concepts of Piaget and Hebb to be discussed shortly.

Spence (1961a, 1961b) also conceives of schemata as trace organizations. The traces which make up Spence's schemata are referred to as "meaning units" which are connotations organized into one conceptual representation, the schema. Here, as with Klien and Holt, Spence's trace, with its meaning related composition, does not seem purely tracelike in that it is more than simply a record of an event.

Reiff and Scheerer (1959) propose a memory system whereby traces, as representations of the past, do exist simultaneously with schemata. They propose two kinds of memories: memoria and remembrances. Memoria are basically tracelike memories of facts, unrelated to an individual's self, and unaffected by time. Remembrances are memories which are related to the self. Reiff and Scheerer see remembrances as being inextricably tied in with schemata.

Remembrances are viewed through schemata, and because schemata change over time, remembrances are thereby subject to change. For Reiff and Scheerer these remembrances are ways of viewing and organizing, similar to the concepts of Northway and Vernon. However, Reiff and Scheerer further explain that the schemata, as part of the individual, go through a stage by stage development. The result of this development is that events which occur at one life stage can never again be viewed exactly the same in later stages as the individual's ways of viewing, his schemata, change along with the continuing development of the individual. Reiff and Scheerer's accent on the developmental quality of the schemata is important for this thesis in finding a schema concept which can adequately represent the memory attribute realness. Such a schema must be one which does develop over time since the judgement of what is real is seen as being a product of learning, hence development.

The last schema conceptions to be dealt with here are those of Piaget and Hebb. Both theories differ from the previous conceptions in that their schema is viewed as a smaller unit, and not so clearly an organization of traces. Piaget uses the term schema not so much as a memory structure but as a unit of behavior. For Piaget each schema represents a specific piece of generalizable behavior, and conversely any piece of generalizable behavior must for Piaget be represented by a schema. The schemata can be both simple or

complex, where they may represent relatively simple behavior like the act of hitting two things together or a complex rule of logic. Schemata are seen by Piaget as developing out of the already present schemata which the infant has at birth. The innate schemata are very simple, specific and reflexive. During early childhood the schemata remain simple dealing mainly with motor activity. However, as the child develops, new and more complex schemata are built up, growing via the modification of old ones. Piaget speaks of alimentation and accomodation as the ways that the schemata develop through interaction with the environment. Alimentation is the process whereby schemata grow via the reception of repeating patterns from the environment. Accomodation is the process whereby the schemata change to fit the environment. Through these processes the individual's schemata become both more numerous and more complex. The end result is a system of relatively complex schemata whose basic role is that of mediating between environmental stimuli and behavior.

The last conception of schema to be dealt with here is that of Hebb. Utilizing a schema similar to Piaget, Hebb (1949, 1952) was nonetheless more concerned with structure and also offered a bridge between the very simple and highly complex schemata. For Hebb all memory can be traced to the activation of reverberating circuits which are built up from infancy. From birth stimulation from the external

world creates, strengthens and modifies these reverberating circuits. The circuit growth, basically the result of learning, comes about by virtue of the strengthening by use and the wearing away by disuse of synaptic connections, with the final result that each circuit comes to respond to only certain patterns of stimulation. This means that ultimately there comes into existence a system of many individual circuits each triggered by different patterns of stimulation. Each of these circuits Hebb saw as representing some aspect of the external world, not however, as exact reproductions of events but rather as conceptlike representations.

Hebb believed that there were two kinds of circuit systems: the cell assembly and the phase sequence. The cell assembly he saw as first built up in infancy and being characteristic of early childhood, formed basically on association principles. The phase sequence, connected with later development, was made up of systems of cell assemblies and hence had to follow the development of the former. These phase sequences differed from the cell assemblies in that they represented more complex concepts and were themselves more flexible. In its ultimate development the phase sequence possessed a relative independence from external stimuli. Though they could be activated by the appropriate pattern of stimulation, the stimuli which fit the particular phase sequence, they were in maturity stable structures

and rarely subject to change. In short, for Hebb the cell assemblies and phase sequences become two levels of schemata, the former simple and basic, the latter complex and derivative. The phase sequence in fact becomes a schema which is an organization of not traces, but schemata.

A Restatement of the Hypothesis

Returning to the major hypothesis of this thesis, what was required was a conception which would allow for a record of an event and a judgement about qualities pertaining to that event to be separate in storage, but joined in the conscious memory. This means at least two totally separate units which can come together to form the final conscious product.

Hebb's theories, while supplying a useful schema model, also pose a problem in that his system makes no recourse to traces. This exclusion of any tracelike entity is questioned by Paul (1967) who feels that Hebb fails to give proper explanation of the phenomenon of "the recall of the particular." Paul gives the example of the memory of a particular triangle. He says Hebb's system would provide a schema for triangle, for a given color, for a given size, but there would be no structure to bring about the recall of a particular triangle of particular color and particular size. Penfield's findings, previously mentioned, also argue

strongly for some kind of trace conception. The analog here to Penfield's specific memories and Paul's particular triangle would be a specific real or imagined event. With such a memory there could be a Hebblike schema for realness, or for many other qualities of the memory, but there would remain the necessity for something to bring about the remembering of the specific event in question. Hence some kind of a trace does seem indicated in order to understand the major hypothesis presented here.

If the trace is to contain the record of the specific event, then it is left for the schema to house realness. Realness, however, must be only one of a class including many other schemata. This raises the question as to what the realness schema and all the other schemata have in common that the trace does not. That is, what is the basic addition of the schema to memory? The answer to this is not altogether clear. The schema theories already cited here seem to emphasize the schema's role in ways of perceiving and especially behaving. With regard to the specific schema in question here, the judgement of real or imagined, the addition is most clearly connected with specific behavior patterns. In remembering without the addition of the realness schema, the individual would have no way of deciding whether or not to activate certain behaviors. These behaviors are those which would be activated in response to the memory being real or the memory being imagined.

Since realness is seen here as a judgement based on a review of the data available from a given remembered event, a process seems indicated where the activation of the record of the event precedes the activation of the realness judgement. Hence the activation of schemata is seen to be triggered by specific stimuli patterns characteristic to the specific schema in question. This is basically identical to Hebb's conception of the activation of the schemata and to Bartlett's concept of "effort after meaning." What, however, remains unclear is whether or not the specific stimuli patterns which activate the schema realness are traces. If they are not, then perhaps they correspond to some kind of lower order schemata, following Hebb's idea of differentiated levels of schemata. But still the need for some underlying trace to correspond to a given event remains. These ideas will be discussed in further detail later in this paper.

At this point the original hypothesis of the sameness of the memories of actual and imagined events can be restated in terms of trace and schema. "Actually happened," and "imagined" are seen to correspond to concepts which are represented by individual schema. The trace, as a record in some form of an event laid down at the time of the event's occurrence, contains no record of whether an event actually happened or was imagined. "Actually happened" and "imagined" only become connected with the memory of the event at the time of remembering. In remembering the trace is activated

and, as it moves towards consciousness, activates in turn whichever schema "actually happened" or "imagined" that the stimulus pattern of the given trace fits (as noted before there may be intermediary steps between the trace and these schemata). This then creates the conscious memory composed of both trace and schema in an integrated whole, that is, a conscious memory of an event experienced as either having happened or having been imagined.

Related Topics

Finally before describing the experiment done here, certain issues current in memory theory will be discussed briefly. Though they are not directly related to the main topic of this thesis, they are of particular interest in current theory and deal with issues which are related if not similar to those dealt with here. This discussion will try to establish what relevance this thesis has for these issues.

Absent from the previous discussion has been any reference to short-term or long-term memory. The main reason for this omission is that the hypothesis of the sameness of real and imagined memories (and the experiment to be described shortly) makes no such differentiation. This does not mean that this thesis denies the existence of such a differentiation or that the distinction between short-term and long-term memory has no effect upon the hypotheses presented here. It means only that the hypothesis of same-

ness simply does not take them into account. There is nonetheless a large body of research which indicates that in the process of remembering there are different rules which apply to remembering over different time periods. These differences have generally been dealt with in terms of the dichotomy between short-term and long-term memory. Melton (1963) has argued against this distinction but the existence of some kind of short-term, long-term difference in remembering has been generally accepted.[1]

The recognition that there is a difference in the process of remembering for short and for longer periods of time has led to models of memory which go beyond the relatively simple short-term, long-term dichotomy. Sperling (1960) proposes such a system having a three step model. According to Sperling first there occurs a complete sensory image of events happening as they occur. Second there is a short-term memory containing limited information based on what can be obtained from the sensory image, which fades rapidly. Third is the long-term memory which involves some kind of conversion process from the short-term and which has a virtually unlimited capacity.

Norman (1969) proposes a similar system consisting of sensory, primary and secondary memory. These first two evolved from a conception of a kind of "echo box" (Waugh,

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[1]Adams (1967) presents a fairly extensive review of literature on short-term and long-term memory, particularly with the aim of showing the arguments for and against this memory conception.

1961, Waugh and Norman, 1965) from whence events which just occurred are readily retrievable, but which over time must be rehearsed lest they fade from memory. According to Norman these "short term" memories serve as a step between environmental stimuli and memory storage by holding experience momentarily in some recorded form. This allows time for whatever operations are then necessary to transform the experience into a more permanent record via the more complex data processing mechanisms of the brain. This general issue of the different steps whereby external stimuli are converted into a permanent storage, for the most part bypasses the major issues of this paper. This is so because this paper deals mainly with what is assumed to be a permanent record and does not concern itself with means whereby this permanent record is formed. Nevertheless the concepts of trace and schema and their relationship does come up with regard to the process whereby information in short-term storage is transformed into long-term. "In order for material to be stored within secondary memory, it must be integrated within the existing organization: it must fit within the existing schemata (Norman 1969, p. 139)." That is, wherever there is an issue of permanent storage, so the issue of the form of trace and schema are tied in with the more comprehensive models of the memory process.

In recent years more sophisticated mathematical programming and reference to computer techniques have produced a number of attempts at comprehensive memory models. At the

conclusion of this paper reference will be made to some of the concepts born of the computer simulation models. However, it is beyond the aim and the scope of this thesis to try to fit whatever conclusions are reached here into the framework of any of these models. What will be spelled out at the end of this thesis will be the specific requirements for any memory model that these conclusions will have, but no specific models will be involved.[1]

Where this thesis differs most from the bulk of research in the field of memory is that most memory research had dealt with some form of the rote memorizing. That is, given a stimulus presented to a subject, will it be recalled and what are the rules which govern this recall. This thesis deals with a subject which is based on the assumption that recall does occur. Its concern is the analysis of what is seen by an individual in recall, namely whether a given memory is real as imagined. This thesis emphasizes the qualities of the conscious memory. It does not examine the rules governing whether a given stimulus or set of stimuli will be remembered, but rather once remembered what is their relationship to the original stimuli. As discussed previously this most closely follows issues of memory raised by psychoanalytic thought and by Bartlett.

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[1]Norman (1970) presents a survey of current models in which he accents the different approaches in creating memory models.

CHAPTER II

PART I OF THE EXPERIMENT

The Problem

The major aim of this research was to both demonstrate and explore the concept of the sameness of the memories of real and imagined events. The experiment performed here sought to demonstrate that despite the ease with which real and imagined memories are normally differentiated, this differentiation is not the result of an intrinsic readily discriminable difference between the two. Rather, an individual learns to recognize characteristics connected with a given memory, other than whether it was real or imagined, and use these characteristics in making the real-imagined differentiation.

In order to demonstrate this sameness what was attempted here was the creation of a situation where the real-imagined memory differentiation breaks down. That is, the experiment sought to provide evidence of a failure of the real-imagined memory differentiation in a controlled experiment such that the non-differentiation could be attributed to the basic similarity of the two kinds of memories.

Because the memories of real events and the memories of imagined events are so obviously two separate categories, there have been no previous experiments which sought to establish them as such. The previous experiments which do have relevance for this research have consequently not been concerned with the difference or sameness of real and imagined memories, but rather have dealt with related topics utilizing techniques which were applicable to the research problem posed by this thesis.

One such experiment was that of Gauld and Stephenson (1967), done as part of a larger study in which they wished to question the validity of Bartlett's theory of memory as a reconstructive process. They sought to demonstrate that the memory errors which Bartlett attributed to the unconscious process of "effort after meaning" were a phenomenon over which individuals had conscious control and were more conscious fabrication than unconscious fit. In the experiment Gauld and Stephenson used the same "War of the Ghosts" passage as did Bartlett. They read it to subjects and then had the subjects answer questions about it indicating as they answered the questions the degree of certainty of their answers. The findings were that subjects' estimates of their own accuracy truly reflected their actual performance. Here Gauld and Stephenson felt that, because subjects recognized when they made an error as they were making it, these errors were not so much unconscious

distortions of memory, but rather conscious fabrications.

The major significance of this experiment for this research is not in the conclusion, but rather in the procedure. Had Gauld and Stephenson had subjects indicate their degree of certainty as to whether or not their answers were accurate, not as they made the answers, but shortly thereafter, an altogether situation would have existed. In such a case, if it were true that some of the errors were fabrications, subjects would have had to differentiate between their fabrications and their veridical answers. Hence they would have been required to differentiate in memory between real and imagined events. The contention here is that in such a case the subjects would have been unable to differentiate fact from fabrication, a distinction which they were able to make at the time they were recreating their stories. Conceivably this hypothetical experiment could be used as a model, though it will not be the course adopted here.

Another experiment was an unpublished study by Brenman referred to by Rappaport (1942) in discussing the experimental literature relating memory and affect. The aim of the study was to show that memory distortions followed personality needs. In the experiment Brenman had adult subjects tell well known fairy tales that they had heard in childhood, but not since. These stories were then compared with their standard versions and with versions told

by the same subjects while under hypnosis. Subjects' personality needs were determined by the use of TAT stories.

The findings of the Brenman study show the original stories contained many distortions which, compared with the stories given while under hypnosis, tended to be distorted in the direction of the personality needs of each subject. What was significant for this study was that there appeared to be a difference between the hypnotized and unhypnotized versions of the stories with the implication that hypnosis could bring out an underlying, somehow more veridical version of the stories. Beyond what these findings may suggest about the possible existence of a permanent veridical trace, the study demonstrates the potential value of hypnosis as a tool in studying the difference between real and imagined in memory. Though no utilization of hypnotism will be made here it must remain as a possible means for study of the problem presented.

It was a study by Perky (1910) and duplicated by Segal (1964, 1968) which, though not in the area of memory, used an experimental approach similar to the one which will be followed here. Perky's experiment sought to demonstrate a perceptual similarity between images produced externally and those which were the product of internal imagining. The procedure used was as follows: a subject was seated in a dark room and told to look at an illuminated screen. The subject was then instructed to imagine various objects on

the screen, that is, to project his own internal image of the given object onto the screen. The objects used were simple ones like a banana or a tomato. After the subjects had established an image, a second real image of the same object they had been asked to imagine, was projected on the screen without the knowledge of the subjects. This real image was dim, but at a previously established supra-threshold level. Subjects were asked whether there was in fact a real image of the given object on the screen. Both Perky and Segal found that under these circumstances subjects were unable to distinguish their own internally projected image from the real external one and said that there was no real image.

The particular relevance for this research is that Perky and Segal dealt with two categories of stimuli, external and internal imagery which, as with real and imagined memories are readily differentiable in everyday circumstances. Perky and Segal created an experimental situation where external and internal images were as similar as possible by eliminating most of the usual characteristics of imagined and external images which usually make them differentiable. They were thereby able to demonstrate a perceptual confusion of the two.

The experiment performed here followed an approach similar to that of Perky and Segal. Basically the experiment tried to create stimuli which, except for being either actual

or imagined, were as much the same as possible. When these events were recalled, the only way that they would differ was that they were either real or imagined. This then provided a test for the major hypothesis of this research, for if real and imagined are indistinguishable in memory, then for the memories created in the above fashion, real and imagined should be indistinguishable.

In an experiment such as this one, dealing with a subject as broad as all memories real and imagined, the focus had to be directed to a more limited category. Consequently, the experiment performed here concerned itself only with memories of words, spoken and imagined. For imagined words, the experiment dealt specifically with words which had been imagined to have been spoken, as opposed to the picturing of written words. This distinction will be gone into in more depth with regard to the instructions within the experiment. As the experiment sought to create real and imagined stimuli which were as similar as possible, the simpler the stimuli the more easily they could be made similar.

The experiment done here sought to demonstrate the sameness of the memories of real and imagined events by creating a situation where subjects were asked to differentiate in memory between words imagined and words actually spoken where the imagined and spoken words differed only in that one was spoken and the other imagined. It was postulated that in such a situation it would be possible to demonstrate

a breakdown in the normal ability to differentiate between what was said and what was imagined.

Subjects

The nature of the experiment, to be detailed shortly, does not make requirements for any kind of specialized population. As the hypotheses underlying this research are conceived of as general memory characteristics, they are thereby seen as generally applicable, at least to adult populations. Consequently, no attempt was made to limit the experimental population other than avoiding children. The reason children were not included was because as the real-imagined memory discrimination is seen as one which is learned, there may be an age at which the discrimination is imperfectly learned. No attempt will be made here to speculate about what age this discrimination matures and becomes stable. Hence for the purpose of both simplicity and relative certainty, no subjects under sixteen years of age were used.

Subjects were adults over sixteen recruited generally, though not exclusively, from the Uptown Branch of the City College of New York. The method of recruitment was that notices were posted asking individuals to volunteer to take part in a psychology experiment in memory lasting approximately one hour. Payment, five dollars for taking part in the experiment, was offered to those volunteering as subjects.

All individuals who volunteered as subjects were used in the experiment. The total number of subjects taking part in the experiment was 40.

Subjects participated individually in the experiment which involved a single experimental session lasting approximately an hour. The experiment was administered by a single experimenter in a room free from any distractions. The experimenter sat across from the subject, separated by a table.

Subjects were first told that the experiment was one in memory which would chiefly involve being asked to remember facts about various stimuli which would be presented. Subjects were also told that a number, not a name, would be all that would be connected with the data from the experiment, as there would be no need to call subjects back.

The experiment had two parts: I and II. Both parts were administered to each of the 40 subjects, Part I always preceding Part II. Their content and purpose will be explained shortly.

Overall Procedure

Part I was the part of the experiment which dealt primarily with the main hypothesis of the research, the sameness of real and imagined events in memory. Its aim,

as discussed previously, was to create an experimental situation where real and imagined events were made as similar as possible so as to demonstrate the difficulty in demonstrating real from imagined in these circumstances. Part I was composed of three separate treatment conditions IA, IB and IC. Each condition was administered to each subject. There were four different sequences in which these conditions were presented: 1) IA, IB, IC; 2) IB, IA, IC; 3) IC, IA, IB 4) IC, IB, IA. The forty subjects were divided into four groups such that there were ten subjects for each sequence.

Condition IA was the main experimental condition in which subjects had to differentiate said and imagined in memory. Conditions IB and IC were basically comparison not control conditions.

Part II dealt with a corrollary of the main hypothesis. It was basically a learning situation which sought to demonstrate that the real-imagined memory differentiation is a learned judgement based on conscious evidence available at the time of recall. Further that the basis for the judgement is not what is perceived at the time of an event's occurrence, but what is perceived at the time of recall. Part II was administered to all 40 subjects with no variations.

Condition IA

Subjects were told that a list of ten words would be read to them, one at a time. They were told that each word would be prefaced by a verbal instruction, the word "say," or the word "imagine." If the given word, for convenience from here on referred to as the stimulus word, was prefaced by the word "say," they were to immediately say the stimulus word. If the stimulus word was prefaced by the word "imagine," they were to immediately imagine saying it. Instruction here was very specific. The subjects were asked to, "imagine as if you are saying the word, but do not say it. Do not move your mouth or tongue or teeth, but say the word to yourself without actually speaking." After the subjects either said or imagined a given stimulus word the experimenter then said a new word until a list of ten was completed. Subjects were then told that after the list of ten stimulus words was completed, they would be asked whether they said or imagined the given words.

After the instructions were completed and any questions were answered by rereading the relevant part of the instructions, the experimenter went through a list of ten words in the same manner as presented in the instructions. Hence a list of ten words were read to the subject, half prefaced by "say," half by "imagine," with the subject either saying or imagining each word in accordance with the

instructions. The two instructions, "say" and "imagine" were randomized over the ten stimulus words. The words used were: cat, dog, pig, cow, horse, deer, duck, hen, bird, goat. This was the basic set of stimulus words which was used in all of the different experimental conditions throughout the experiment. The order of presentation of these words was randomized for each presentation to each subject. The choice of the specific ten words was based partially on the Lorge-Thorndike (1937) frequency lists and partially on judgement as to which words seemed less distinct, forming more of a homogeneous group than others.

Ten words were used because it was desirable to have a list too long to allow subjects to hold completely at one time, but otherwise as short as possible. The shortness is important because the task of differentiation of said and imagined should have been as easy as possible such that if difficulty was experienced the length of the list could be discounted as much as possible as a contributor to this difficulty. Miller (1956) emphasized seven plus or minus two as representing the normal limits involved in the processing of bits of information. Wechsler (1955, 1958), in utilizing nine as the upper limit in the digit span subtest of the WAIS, makes a similar assumption. Consequently ten becomes the number of bits of information which can be assumed to transcend the capabilities of virtually all individuals, and was thereby used here.

When the list was completed, the words were read back to the subject. They were read one at a time, in a newly randomized order. Subjects were instructed to say whether they said or imagined each given word. In the recall, the experimenter said, "cat," and the subject said, "I said it" or "I imagined it." Subjects were told to make a guess even if they were not sure. The forced choice procedure was necessary here because it eliminated the possibility of a third undecided category.

Subjects were scored right or wrong for each answer. This produced an accuracy score of the number right and wrong for each subject for each set of ten words. These scores were the major basis for the subsequent statistical analysis. Following the rereading and scoring of the words, referred to here as the recall period, there was an inquiry. The major purpose of the inquiry was to try to provide information about what occurred during the presentation and recall periods that could not be seen in the manifest material. That is, the aim was to know what subjects were thinking that may have influenced their performance. The inquiry acted as the main source in the attempt to build up a picture of the process whereby individuals were able to differentiate real from imagined in memory. The presentation and recall parts of the experiment were basically concerned with trying to establish the similarity of said and imagined in memory. The inquiry sought to understand

how, given this similarity, the differentiation was made.

For each of the words in the inquiry, the experimenter asked, "How do you know that you said (or imagined)....?" While this procedure could not get at all the variables that might have gone into making the real-imagined differentiation in any given instance, it aided in discovering the general nature of these variables. Where elaboration was desired, subjects were asked, "Could you explain that more fully?"

Questions were always asked of the three randomly picked words in each sequence, but in some instances other words were also subject to inquiry. These were words with which unusual occurrences happened during their presentation or recall. This was done because any such occurrence could have aided in differentiation as the stimulus would have tended to stand out from the others in the sequence. It included instances where either the experimenter or subject stammered or slipped in the pronunciation of a word, where any interruptions took place such as a pen dropping, or a knock on the door, anything which might have created a stimulus connected to a word which may have aided in the memory differentiation.

Condition IB

Condition IB followed the identical procedure as with Condition IA except for one variation. Where with IA the

two alternatives were for the subject to either say or imagine the stimulus word following the experimenter's cue, with the control condition the two alternatives were to say or picture. In this condition half of the stimulus words were preceded by the word, "picture." Subjects were instructed that when stimulus words were preceded by "picture" they were to then make a mental picture of the appropriate animal. Hence if the experimenter said, "Picture horse," subjects were then to make a mental image of a horse. The specific instructions were, "make a mental picture of what I am saying." As with Condition IA, Condition IB involved the presentation of the same list of ten animal words, half prefaced by, "say," half by "picture."

In the recall part of Condition IB, subjects were instructed that upon the reading back of each stimulus word they were to either say whether they said or pictured the given word. The inquiry for Condition IB followed the same procedure as with Condition IA. As with Condition IA, Condition IB consisted of three sets of ten words.

Conditions IA and IB thereby presented two separate memory differentiation tasks. They were the differentiation of said-imagined, and of said-pictured. Normally both can be easily differentiated. This thesis claims that said and imagined are the same in memory and consequently memories require associated memory characteristics to aid in their

differentiation. The thesis makes no such claim for said-pictured, which it assumes are different in memory. Therefore the said-pictured differentiations do not necessarily depend on the associated characteristics for their differentiation. The experimental situation created here sought to eliminate as many of the associated characteristics as possible. Hence, if said and imagined are the same in memory and must rely exclusively on the associated signal characteristics for their differentiation, and if this is not the case with said and pictured, then of the two differentiations, the said-imagined should be the most seriously impaired by the experimental situation created here. The accuracy scores for Condition IA should be significantly lower than for Condition IB.

If the said-imagined differentiation should prove more difficult than the said-pictured, this would not necessarily be a proof that said and imagined are the same in memory. It would simply indicate that the said-imagined memory differentiation was more difficult than the said-pictured. However, since both are readily differentiable in everyday situations there was no reason to assume that in the experimental situation produced here one of the two would prove more difficult to differentiate than the other. This thesis, solely on the basis of a general theoretical hypothesis, predicted that the said-imagined discrimination would prove more difficult than the other. Hence if the predicted

difference did come up, where there was no empirical reason to expect any difference, weight must be given to the hypothesis which fostered the prediction.

Condition IC

Ideally, because of the sameness in memory of saying and imagining, subjects' accuracy for Condition IA would be no better than chance. However, two factors make this outcome unlikely. One was the presence of the experimenter's instruction, "say," or, "imagine," before each word, which if recalled could help the subject in deciding whether he said or imagined the given words. The second factor was the subjects' ability to make the said-imagined differentiation based on information other than their actual memory of either saying or imagining the given words. This is in fact what is postulated here to happen in everyday life. What was needed then was an experimental task as similar as possible to IA, but which did not include the actual saying and imagining of the given words. This was the purpose of Condition IC.

Condition IC was made up of two ten word trials. In one trial, Condition IC1, as with Condition IA subjects were presented with the sequence of ten animal words, half prefaced by the experimenter's instruction "say," and half by "imagine." Subjects were instructed before the presentation that they were in no way to respond to the

experimenter's words but rather they were to simply listen. Following the sequence of ten words the list was read back to them and they were asked to tell which words the experimenter prefaced by "say," which by "imagine." In the presentation there was a pause between each word set of approximately two seconds to correspond to the time in which in Condition IA the subjects would have either said or imagined the stimulus word.

The second trial, Condition IC2, was identical with the first except that the alternative words were say and picture. This was to make sure that there was no significant difference between the pairs of verbal cues "say" and "imagine" and "say" and "picture." In the comparisons with Conditions IA and IB these two trials were always dealt with together as Condition IC. This was on the assumption, born out in the statistical analysis, that there was no real difference in the difficulty of the differentiation task between Conditions IC1 and IC2.

The major difference in the differentiation tasks of Conditions IA and IC was that with IA subjects had an additional piece of information to aid them in remembering whether they said or imagined a given word. This was their actual saying or imagining of the word. If, as this thesis maintains, there is no difference in memory between the memories of saying and imagining then there should be no significant difference between subjects' performance on

Conditions IA and IC. Consequently, though subjects' accuracy on Condition IA may well significantly exceed chance, it should not significantly exceed subjects' accuracy on Condition IC. The experiment assumes that subjects' accuracy on Condition IA will exceed chance and it is the purpose of the inquiry to attempt to explain how it is that subjects are able to make the differentiation despite the sameness of real and imagined.

A non-significant difference between IA and IC cannot prove that the difference between the two. The actual saying and imagining of the words is of no use in making the said-imagined differentiation, though this is a possible implication. The non-significance does, however, account for the probable better than chance accuracy scores for IA. It is the significant difference between IA and IB which combined with the non-significant difference between IA and IC which would most strongly indicate the validity of the major hypothesis.

Results--Mean Comparisons

The major single comparison from the data for Part I was that of Conditions IA, IB and IC. Prior to any individual comparisons an overall analysis of variance was done for these means. The means for IA and IB were based on a total of 120 trials for each condition, the mean for IC is based on 80 trials. These means, the standard deviations

and the analysis of variance based on the three experimental conditions are shown in Table 1. As the overall F was significant, t tests were done to make the significant mean comparisons, these results are seen in Table 2.

As can be seen from these results, the major hypotheses are borne out. Conditions IA and IB did differ significantly (p .001) whereas Conditions IA and IC did not. There is little question but that within the experiment differentiating saying from imagining in memory was a different and significantly more difficult task than differentiating saying from picturing. On the other hand IA and IC were not significantly different, despite the fact that with IA subjects had for an added bases for differentiation the actual saying or imagining of each word. Not only were IA and IC not significantly different but there were indications that they did represent the same population. The means and standard deviations for IA and IC were 7.35 and 7.28, and 2.01 and 2.03, respectively, while the mean and standard deviation for IB were 8.22 and 1.57. If, in fact, IA and IC were of the same population it would mean that the actual saying and imagining of the stimulus words, present in IA but not in IC, were of no aid in their later differentiation. This, of course, would represent a very strong argument for the major hypothesis of this research.

Condition IC was divided into two trials. With one the experimenter said "say" or "imagine" before the stimulus

TABLE I

MEAN ACCURACY SCORES FOR ALL SUBJECTS FOR CONDITIONS IA, IB AND IC (N=40)

	Mean	s.d.	Number of Trials
Condition IA	7.35	2.01	120
Condition IB	8.22	1.57	120
Condition IC	7.28	2.03	80

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Conditions IA, IB and IC	2	34.57	20.06	.001
Subjects	39	13.92	7.05	.01
Interaction	78	1.72	.88	n.s.
Error	200	1.93		
Total	319			

TABLE 2

t COMPARISONS FOR CONDITIONS OF PART I FOR ALL SUBJECTS (N=40)

Source of Comparison	Mean Difference	t	P
Conditions IA and IB	.87	3.75	.001
Conditions IA and IC	.07	.27	n.s.

words, with the other the experimenter said "say" or "picture" before the stimulus words. In the recall subjects were asked to say whether "say" or "imagine" or "say" or "picture" preceded the stimulus word. It was assumed that IC1 and IC2 did not actually differ in the nature of the task and hence also in difficulty. Statistics based on Condition IC would therefore combine IC1 and IC2. This was done in the comparisons of IA, IB, and IC. This, however, necessitated no significant difference between IC1 and IC2. This was the case as seen in the means and analysis of variance in Table 3 in the Appendix.

Because the experiment consisted of repeated trials of quite similar experimental situations, one possible experimental result which had to be looked for was whether their was a change in subjects' accuracy purely to the effect of the repeated trials. This could either have been an increase in accuracy perhaps due to a practice effect, or a decrease due to a confusion from using the same animal words in repeated trials. This meant that it was necessary to do multiple analyses comparing the effects of different trial positions on accuracy. These comparisons involved both overall trial position effects and that trial positions within the individual experimental conditions.

Subjects' accuracy on the three trials of Conditions IA and IB, and on the two trials of Condition IC. With these three comparisons there were only slight mean differ-

ences, none approaching significance. These comparisons can be seen in detail in Tables 4, 5, and 6 of the Appendix.

With the overall position effects a direct comparison of the means for these eight trial positions is not a meaningful comparison because each position was not composed of the same conditions. For example, the sixth trial over the forty subjects was made up of twenty trials of IA and twenty trials of IB. On the other hand, the seventh trial was composed of ten trials of IA, ten of IB and twenty of IC. Consequently, a difference between the sixth and seventh trials could be attributed not to their relative position, but to what conditions actually went into the specific trial. Because of this consideration, comparisons were made between the following two groups: trial positions 1, 2, 7, and 8 and trial positions 3, 4, 5, and 6. These two sets of comparisons are meaningful because the trial positions within each group are made up of exactly the same conditions as the other trials within the group. The means in the two groups and analyses based on these means are in Tables 7 and 8 in the Appendix. These results were all non-significant.

The above non-significance indicates that for all the subjects where trials were of comparable composition, the trial position in and of itself had no effect on accuracy. It does not, however, say anything about whether trial position within the overall experiment had any effect on

subjects' accuracy for the different treatment conditions. That is, though there was no significant difference overall between Trials 1 and 8 of the experiment, there still may have been a significant difference for Condition IC between trial position 1 and trial position 8.

One way of finding out might be to compare the trial positions within each experimental condition. For example, Condition IC could be broken down into trial positions 1, 2, 7 and 8, the four positions at which Condition IC occurs. However, such comparisons would, at best, lead to ambiguous conclusions. The reason that the different treatment conditions do occur at the different positions is because of the four different sequences of the three treatment conditions. These sequences are set up such that the different conditions precede or follow each other. Hence, any effect that might show up for a given trial position could be easily attributed to the particular sequence of conditions. It then becomes impossible to statistically separate trial position effects from sequence effects. Because of this consideration, another comparison method is better used. This is simply to compare the mean accuracy scores for the three treatment conditions, IA, IB, and IC for the different sequences. Hence if there is a significant effect it would have to be attributed to both trial position and sequence. For, though it would be preferable to separate the two, it cannot be done within the

structure of this experiment.

In the experiment there were actually eight rather than four sequences. This was because of the division of Condition IC into IC1 and IC2. It was deemed highly unlikely that the different orders of IC1 and IC2 would have any effect on subjects' accuracy in the other conditions. A simple analysis of variance was done comparing the mean scores for those subjects for whom IC1 preceded IC2, with those for whom IC2 followed IC1. The results were non-significant and are seen in Table 9 in the Appendix. As the relative position of IC1 and IC2 had no effect on accuracy scores within the experiment, for the purpose of clarity and simplicity, further data analyses refer not to eight but to four sequences where the order of IC1 and IC2 is considered irrelevant. The four sequences were: 1) IA, IB, IC; 2) IB, IA, IC; 3) IC, IA, IB; 4) IC, IB, IA. For the three treatment conditions, IA, IB, and IC, the mean accuracy scores for the four different sequences were compared. With none of the three treatment conditions were there significant differences. This data and their analysis are in Tables 10, 11, and 12 in the Appendix.

A last comparison which, though not expected to be significant, had to be done was the comparison of the means for the three conditions, IA, IB and II taken as a whole for the four sequences. These comparisons were not significant and are seen in Table 13 in the Appendix.

A final statistical analysis which was done on the data of Part I was an analysis of the errors in Condition IA. The issue was whether subjects tended to mistake said for imagined more than imagined for said, or vice-versa. If there was a significant difference in the kinds of errors subjects made in IA, this would have to be explained. There were, however, no significant differences. The data are in Table 14 in the Appendix.

Inquiry Results

The main function of the inquiry pertaining to Part I was to give information on how, given that said and imagined were indistinguishable in memory, they could nonetheless be differentiated. However, the inquiry also turned out to be an important source of data which towards the validation of the sameness hypothesis.

In answer to the question at the end of the experiment, "Of the two tasks, differentiating between saying and imagining or between saying and picturing, which do you feel was the most difficult?" 36 out of 40 sucjects said they felt that the task of differentiating saying from imagining was the more difficult, two said there was no difference, and two said the reverse. This is a striking statistic particularly considering that of the 40 subjects in the experiment, only 28 did better on IB than IA, 4 performed with equal accuracy on both and 8 actually did better on IA.

Of these 8 subjects who performed better on IA than IB, 6 nonetheless said they thought IA to be the more difficult task. That is, even though some subjects were actually better able to differentiate said from imagined than said from pictured, the majority of these subjects still said they felt differentiating said from imagined to be the more difficult task. These results give further validity to the significant differences found in the mean comparisons of IA and IB.

In answer to the question, "On the trials where you were asked to differentiate between what you said and what you imagined, in differentiating the two did you have any system that you thought helped you?" 39 out of the 40 subjects answered, "Yes" and went on to describe some kind of system.[1] Subjects' answers to this question plus their responses to the inquiry following the individual trials of Condition IA described the various methods which subjects utilized in differentiating said from imagined. An attempt was made to make these systems into categories. The following categories do not exhaust all the examples but they do include the great majority of instances:

1) Sound cues - These (which applied only to said words) were made up of those instances where subjects remembered anything about the way in which they

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[1]It was quite evident from the inquiry following the three trials of Condition IA that the one exception also used systems. However, the subject was not questioned further.

said a given word which would then indicate to them that they in fact did say it. An example of this would be where a subject exaggeratedly enunciated the consonants of a given word.

2) Position cues - Here subjects said they remembered a word through its position in the list. (This was most often either the first or last word)

3) Categorizing - This was the forming of groups of words on the basis of similar categories. These include such groupings as all farm animals as well as all the words beginning with a given letter. This method obviously depended upon whether all the words in a given group were either said or imagined.

4) Associations - This category, perhaps a sub-category of the above, refers to where the memory of whether a given word was said or imagined came up in association with another word: "I remember I said 'cat' and imagined 'dog'."

5) Repetition cues - These were instances where a subject remembered that he either said or imagined a given word by the similarity or contrast to what he did for the word on the previous trial: "I remember saying it the first time and not this time."

6) Lists - Those were instances where subjects built up lists of words during the presentation of

the ten words. As a result, subjects would have at the end of the ten words a list, usually of five words, which were either words they said or those they imagined. The lists enabled them to determine in the recall whether a given word was said or imagined. If the word was not on the list, it was then said to be the opposite.

The above methods were not employed exclusively in Condition IA. They were also used, though not to the same extent, in IB and assumedly (though there was no inquiry) for IC. The extent that these six systems were employed by subjects in the said-imagined differentiation task can be seen in Table 15 which shows the number of subjects who employed each system at least once as indicated by their responses to the inquiry following Condition IA and to the questions at the end of the experiment.

Four hundred seventy-one responses were questioned, "How do you know that you said (or imagined) ...?" in the inquiry following the individual trials of Condition IA. The 471 represents 360 words randomly picked, plus 111 chosen for inquiry after the trials were completed. The bases for choosing the extra 111 were not very specific. Sometimes an extra word was questioned when it had been mispronounced by a subject. Sometimes extra words were chosen simply to gain more information in that the data from the random words seemed insufficient. Hence the choice of

TABLE 15

NUMBER OF SUBJECTS USING EACH SYSTEM AT LEAST ONCE

Sound cues	11
Position cues	20
Categorizing	15
Association	12
Repetition cues	12
Lists	30

extra words was solely at the discretion of the experimenter. The question asked for these extra 111 was exactly the same as for the random 360.

In answering the question, "How do you know that you said (or imagined) ...?" there were four alternative types of answers that subjects gave. The first of these was to say that they could not answer the question, "I don't know." The second alternative was to state that they had guessed. The third alternative was to explain some kind of method. The last alternative was to make a definitive statement of remembering without further explanation, "I remember saying it."

Out of the 471 answers recorded, 53 were of the first "I don't know" alternative. As this is really a no information answer and consequently particularly difficult to interpret beyond the statement itself, no further analysis was made from these answers.

There were only 11 instances of subjects reporting that they guessed. Because of this small number no further analysis was made of this alternative. Also, because of the small number, it is questionable whether subjects in responding really differentiated between the first two alternatives, though on the surface they do have a different meaning.

In 307 instances out of 471, subjects answered the question, "How do you know that you ...?" with some kind

of explanation that went beyond a statement of simply remembering. There was not a description of some kind of system with all of these instances, but there was with most. The nature of these explanations has been discussed previously with regard to systems and will be taken up again.

There were 100 instances of subjects answering either, "I remember saying it," or, "I remember imagining it." It is these instances which will be particularly noted here.

Given that the major hypothesis of this research were not true, then said and imagined would be different in memory. In this case where subjects were asked, "How do you know that you...?" for a given word, if they actually remembered saying or imagining it, they would most likely say either, "I remember saying it," or "I remember imagining it." The presence of this form of response would seem to contradict the sameness hypothesis. However, subjects in giving these responses followed a particular pattern which seemed to indicate quite a different conclusion. When subjects said for words which they thought they had said, "I remember saying it," then for the words they thought they had imagined they would not say, "I remember imagining it," but rather, "I don't remember saying it." The same was true where subjects used, "I remember imagining it," for words they thought they imagined. For words they thought they said, they would use, "I don't remember imagining it." Of the 25 subjects who used the "I remember saying it," form

of answer to the question, "How do you know that you...?", only two used "I remember saying it," and "I remember imagining it" as alternative answers. The other 23 used one or the other with its negative. Further, though hardly significant, the two who did use the first two alternatives had below fifty percent accuracy in those instances.

The contention here is that the use of the statement and its negative form was indicative of subjects meaning not, "I remember....." but "I remember that..." where "I remember...." indicates an actual recalling of the given event. "I remember that..." is seen here as indicating the recall of information which in turn indicates to the individual that a given word was said or imagined. This would follow the major hypothesis which claims that individuals use information other than the actual memory of saying or imagining to make the said-imagined differentiation. There was considerable evidence within the experiment to substantiate this contention.

With those subjects who reported using lists of either the said or imagined words, in the inquiry they did not say, "I remember that I said..." but invariably "I remember saying...," yet these mental lists which they would check in recall were clearly not memories of actually saying but rather simply a memorized list of animal words, in short, a memory <u>that</u> they said the given words. Further, in those instances where subjects reported having made lists of said

words, when they said that a given word had been imagined, they did not say, "I remember imagining it." Invariably they said, "I remember not saying it." Not all subjects who used the form, "I remember saying it," and its negative used the system of making a list, but all subjects who made a list did use that form.

With the alternative system, "I remember saying it," for the words a subject thought he had said and "I remember imagining it," for words he thought he had imagined there is a strong argument that subjects did mean that actually remember the event of saying or imagining. However, this set of alternatives occurred with only two out of twenty-five subjects for Condition IA (in the instances with these two subjects their accuracy was below fifty percent).

The above is in strong contrast to what happened on Condition IB. These subjects were asked to differentiate between said and pictured. Where in IA only 2 out of 25 subjects (who used the, "I remember saying..." form) used "I remember saying..." and, "I remember imagining..." as alternatives, 25 out of 37 used, "I remember saying..." and, "I remember picturing..." as alternatives in IB. This is a striking statistic because it clearly indicates that the use of one form and its negative (as with most subjects in Condition IA) as opposed to the two separate alternatives (as with most subjects in IB) was not simply a matter of language preference. Rather it was indicative of a real

difference between Conditions IA and IB. A difference whereby with IB subjects actually could remember having pictured as opposed to having said, while with IA subjects could not remember having said as differentiated from having imagined. Rather with IA subjects had to remember other information which indicated to them that they had said or imagined the given words which is the major hypothesis of this thesis.

Overall, with Part I, while there was considerable individual variation as to what subjects did over the different trials, there was a general pattern, with many exceptions, which did evolve, and which will be described here briefly. This pattern applies most specifically to how subjects tended to handle Condition IA, the differentiation of said from imagined and was not nearly so apparent for IB, said from pictured, where they were able to rely on the specific memory of the event as an aid in differentiation and had less need of systems.

On the initial trials subjects tended to rely on devices that could help with individual words or with small groups of words, but not all ten. "Cow and cat were two c's and I said them." "I remember cat and dog because I have a cat." "You said dawg, I said dahg." "I connected cat and dog, I knew I said dog because I made a note of it." These were facts about individual words which enabled the subject to know whether that specific word and perhaps one or two

other words paired with it were said or imagined. These kinds of aids were employed by subjects throughout the experiment, "The two c's I always tried to remember if I imagined them or not." However, though they were not exclusively used on the initial trials, their presence was more pronounced towards the beginning.

In the course of the experiments most subjects attempted to come up with some kind of method which would enable them to know more than just a few words and these more powerful systems tended to show up in later trials. One such system was to group the animals into associative clusters in the way described by Bousefield and Cohen (1955). The groupings used were most often farm, not-farm or domestic-wild. One problem here was that the animals were not readily classifiable, and the best classification of farm, not-farm: cow, horse, duck, hen, pig, goat - deer, dog, bird, cat, does not split them evenly. Of course the main problem was that any classification could only work when the categories coincided or at least partially coincided with the test categories, said and imagined.

There were a couple of instances when subjects established categories which did coincide with which words were imagined, which were said, and in these instances they got all ten right. However, as a rule groupings of this nature were at best of limited value. Far and away the best system was the one where subjects made a mental note of the words

in one of the categories, either the words they said or the words they imagined, building up a list of all the words in this category as they went along. This list would be either of those words they said, or those words they imagined. This way at the end of the ten words, they would have a list of five words garnered by a repetition of the words in the list as it grew during the presentation. These words by designation would either be said or imagined, the words not on the list would be the opposite. This method of listing was rarely adopted from the start, but rather it was employed by subjects as the experiment progressed. The prevalence of this lists system was seen by the fact that 18 subjects in answer to the question of whether they had a system used the specific word "list" in describing the system they did use. All told, 30 of the 40 subjects indicated that they were using a system similar to the one above.

CHAPTER III

PART II OF THE EXPERIMENT

Aims and Procedure

The major concern of Part I was to demonstrate the sameness in memory of real and imagined. Part II was concerned with the process whereby, despite this sameness, real and imagined are differentiated. A corollary of the above hypothesis was that the real-imagined memory differentiation is a learned judgement based on conscious evidence available at the time of recall, rather than the actual saying or imagining of a given word. Part II attempted to demonstrate this corollary particularly emphasising that the basis for the judgement is not what is perceived at the time of the event's occurrence, but what is perceived at the time of recall.

Condition IA of Part I attempted to create a situation where all stimuli other than the actual saying or imagining of a given word were eliminated. It was postulated that in such a situation the differentiation in memory between said and imagined would break down, in a sense the old learning was no longer adequate. Hence Condition IA, Part I created

a special situation where subjects were asked to differentiate between said and imagined, a task normally taken for granted, and they could not. What they had learned as the way to differentiate said from imagined was of no use to them. In this situation where old learning is no longer adequate, subjects may become receptive to new learning. Part II was just such a new learning situation. In Part II subjects were supplied with new cues controlled by the experimenter which they could learn to use in making the said-imagined differentiation.

Part II consisted of the presentation and recall of ten word sequences. The presentation parts of these sequences were identical to those of Condition IA. Subjects were told: "We will again follow the previous procedure where I presented the ten words preceded by either "say" or "imagine" and you are either to say or imagine the words, as instructed. There will, however, be a difference in the recall procedure which will be explained after we have completed the word list. Remember that when I say "imagine," you are to immediately imagine saying the word, do not make a picture of it." Subjects then said or imagined the ten animal words.

It was in the recall of the words in Part II that the variation occurred. In the recall of the first list of ten words, Trial 1, subjects were instructed, "I will now read the words back to you and you will tell me whether you said

or imagined each word. This time, however, after you have responded for each word, I will tell you whether you actually said or imagined the given words." Hence subjects got immediate feedback on the accuracy of their responses.

Another variation was that when the individual words were presented in recall by the examiner, some of them were said rather loudly, the others softly so that there was a distinct difference between the two modes of word presentation. The loud presentation was for all words which the experimenter said were said. The soft were for all words the experimenter said were imagined.

The reason for the emphasis on what the experimenter said happend, relative to loud and soft, was that although on the first set of ten words the experimenter's response either, "You said it," or "You imagined it," was appropriate to what the subject actually did, this was not the case with the second and third sets of ten, Trials 2 and 3, which immediately followed the first. In these last two sets the experimenter's responses were just the opposite of what actually transpired. That is, if the subject actually said the word the experimenter said he imagined it, if the subject imagined it, the experimenter said he said it. This also meant that when, in recall, the experimenter said a wor loudly it was for a word which was imagined, although the experimenter stated it was said. Conversely, if a word was said, in recall the experimenter stated the word softly and

said that the word was imagined. Hence the loud-soft cues were false, given to the subject with the express purpose of deception.

Part II attempted to have subjects, when trying to make the said-imagined memory differentiation, abandon their own memory records in favor of the experimenter's loud-soft cues. Should this have occurred, the subjects would have been making a judgement based solely on an external event taking place at the time of recall and would have given up all reference to their memory of the actual event's occurrence.

In order to maximize the possibility of deception, for the first word in the presentation sequence of the last two sets the loud-soft cues and the experimenter's "You said it," or "You imagined it," were true to what actually occurred. The deception in the last two word sets applied only to the second through tenth words of the presentation. Studies (Robinson and Brown, 1926; Hovland, 1938) have indicated that in word sequences of ten and twelve words the first word is far more likely to be remembered than the others. This means that for the first word of the animal word sequences, the experimenter's "say" or "imagined" were likely to be remembered. If this occurred it could have made the subjects aware of the deception. Consequently, for the first word no deception was attempted.

The inquiry for Part II, unlike Part I, came only after

the completion of the three presentation and recall sections. In this inquiry subjects were asked, "How were you able to know which words you said or imagined on this last trial?" The last trial was singled out because it would be the most effected by the loud-soft cues. If subjects did respond to the cues, they were most apt to do so on the last sequence. The aim of the inquiry was to determine whether the subjects noticed the loud-soft cues. If they made no mention of the cues they would then be told of the cues and asked if they had been conscious of them.

Part II could have yielded four possible outcomes. One was that the subjects' responses followed the loud-soft cues resulting in a significantly lessened accuracy on the latter two conditions, yet without the subjects' having been aware of the existence of the cues. In this case, it would be possible to infer that in differentiating said from imagined, the subjects made the memory differentiation on the basis of cues present exclusively at the time of recall, abandoning all evidence supplied at the time of the event's occurrence. They may also be said to have "perceived" the memories as said and imagined in response to the recall cues.

A second possibility was that subjects' responses would have followed the experimental cues but with recognition of the presence of these cues. Here the subjects would perceive the cues as being separate from the remembered event but were nonetheless willing to abandon all evidence from

their own memory in favor of them anyway.

A third possibility would be that the subjects would have recognized the cues but chose to ignore them. In this case, though the cues may still have had an effect, the data must be interpreted as if the cues did not exist, regardless of the subjects' performance in the three recall sequences. The results in this case, as well as the fourth possible outcome, that of the subjects professing no knowledge of the cues and showing no effect by them in performance, must be interpreted as negative results. That is, they would be interpreted as not disproving the hypothesis of Part II, but lending no evidence in support of it.

The overall hypothesis for Part II was that subjects' accuracy would be significantly worse on the third trial (as the second was taken exclusively as a learning trial) than on the first. If a significant difference was found, then a further breakdown involving the four inquiry responses would be made.

Results--Mean Comparisons

The three trials of Part II had means of 7.95, 5.88 and 6.23 respectively. The analysis of variance for the three trials was significant at a .001 level. Subsequent t tests to determine significant mean differences showed that Trials 1 and 3 did differ significantly at a .01 level. Trials 2 and 3 showed no significant difference. These results are

seen in Tables 16 and 17. The predictions for Part II were realized. Subjects accuracy significantly declined as a result of the false cues. Though Trial 2 was viewed as a learning trial, it was obviously effected just as strongly by the false cues as the last trial. In short there was learning effect in Part II.

The overall figures for Part II, though significant, give only a very general picture of the effect on subjects of the false learning situation. This is because there was considerable variation as to how subjects responded in Part II. A better picture is seen when the results are broken down into categories based on subjects' responses to the inquiry following Part II.

Inquiry Results

The inquiry for Part II had several specific aims. One was to determine whether subjects were aware of the loud-soft cues. Another was to determine whether, given the awareness of the loud-soft cues, did subjects realize the pattern of these cues? A last item to be determined was whether subjects had any realization that the experimenter's cues were false over the last two trials.

On the basis of subjects' answers to the questions following Part II, two sets of categories were established. With the first, pertaining to recognition of the loud-soft cues, subjects were divided into three categories. One was

TABLE 16

MEAN ACCURACY SCORES FOR ALL SUBJECTS FOR THE THREE TRIALS OF PART II

	Mean	s.d.	Number of Trials
Trial 1	7.95	2.55	40
Trial 2	5.88	2.51	40
Trial 3	6.23	2.67	40

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Trials 1, 2 & 3	2	49.36	12.41	.001
Subjects	39	12.36		
Interaction	78	3.98		
Total	119			

TABLE 17

t COMPARISONS FOR TRIAL MEANS OF PART II
FOR ALL SUBJECTS (N=40)

Source of Comparison	Mean Difference	t	p
Trials 1 and 3	1.72	2.91	.01
Trials 2 and 3	.35	.60	n.s.

a no recognition category, the second a pattern category, and third, no-pattern. No recognition meant that subjects, when questioned, gave no indication that they were aware of any irregularity or change in the tone of voice of the experimenter as he read back the words in the recall period. Hence only subjects who answered the question, "Did you notice anything about my tone of voice?", negatively, were put into this category. The pattern category was composed of those subjects who not only recognized that there was a change in tone of voice, but also correctly identified that loud went with what the experimenter said was said and soft went with what the experimenter said was imagined. Hence to be in the pattern category subjects had to have realized the actual pattern that existed in the experiment. Those subjects who reported recognizing the existence of the loud-soft cues but no pattern, or who reported a pattern but not the correct one, went into the no-pattern category.

Subjects were also divided into two other categories, a "realize false" category and a "not realize false" category. In answer to the question, "Did you realize on these last two trials that what I said you had done was directly the opposite of what you actually did?", all subjects who said that they were aware at any time that the experimenter's cues were the opposite of what actually happened were put in the "realize false" category. All other subjects were put into the "not realize false" category. If subjects

being aware for only some of the words that the experimenter's cues were misleading, they were nonetheless put in the "realize false" category.

The significance of finding out whether and to what degree subjects' recognized the loud-soft cues is quite evident. However, further explanation is needed here with regard to why subjects were categorized as to whether or not they realized that the experimenter was at times being misleading. When subjects said that they consciously knew that, at least on some of the words the experimenter's statements were false as to which words were said, which imagined, this means that for these words the subjects were certain of their belief in whether the given words were said or imagined. That a subject was certain that a given word was said or imagined, as discussed previously, does not necessarily indicate that he actually remembered saying or imagining it. However, if a subject was certain for a given word, this does mean that he would then realize that for at least that one word the experimenter was not being truthful.

If a subject knows that in at least one instance the experimenter is lying, then this obviously is going to effect his learning of the loud-soft cues since there is then doubt cast on the reliability of the cues. The reason then that the realize-false and the not-realize-false groups are separated is that their results are products of somewhat different learning procedures. One is where there

is no knowledge that the cues to be learned are not completely veridical, the other where there is knowledge that the cues are not completely veridical.

With both categorizations, the basis for the categorizing was solely the verbal reports of the subjects in response to the questioning following Part II. Subjects' accuracy throughout Part II was then analyzed on the basis of these categorizations. These are seen in Tables 18 and 19. If the two sets of categories are combined into one set of six categories the accuracy scores for the six categories are seen in Table 20.

With the categories based on recognition of the loud-soft cues, as would be expected, the degree to which they did recognize these cues was reflected in the accuracy between the first and third trials. The difference between these two trials for the three categories, no recognition, recognition but no pattern and pattern was +1.25, -.96, and -2.61, respectively (where the signs indicate either improvement or decline in subjects' accuracy from the first to the third trial).

The clear implication of these results is that where subjects were aware of the presence of the cues and their meaning they were influenced by them. Where subjects were not aware of the cues, they were not influenced by them. The improvement shown by the subjects who reported not recognizing the presence of the cues, though representing too small a

TABLE 18

MEAN ACCURACY SCORES OF SUBJECTS FOR THE THREE TRIALS OF PART II WHEN DIVIDED INTO CATEGORIES BASED ON THEIR RECOGNITION OF THE LOUD-SOFT CUES

Category	N	Trials: 1	2	3
No Recognition	4	7.25	7.00	8.50
Pattern	22	8.35	6.01	5.74
No Pattern	14	7.83	5.80	6.87

TABLE 19

MEAN ACCURACY SCORES OF SUBJECTS FOR THE THREE TRIALS OF PART II WHEN DIVIDED INTO CATEGORIES BASED ON THEIR RECOGNITION THAT THE CUES WERE FALSE

Category	N	Trials: 1	2	3
Realize False	22	8.45	6.32	7.26
Not Realize False	18	7.77	5.77	5.00

TABLE 20

MEAN ACCURACY SCORES OF SUBJECTS FOR THE THREE TRIALS OF PART II WHEN DIVIDED INTO CATEGORIES COMBINED FROM TABLES 18 AND 19

Category	N	Trials: 1	2	3
Realize False				
No Recognition	2	7.00	6.50	8.50
Pattern	14	9.00	6.70	7.70
No Pattern	6	7.60	5.40	7.10
Not Realize False				
No Recognition	2	7.50	7.50	8.50
Pattern	8	7.20	4.80	2.30
No Pattern	8	8.40	6.10	6.70

sample for any definite conclusions, may be a result of the aforementioned trend on the part of subjects to improve their ability to differentiate said from imagined over time as a result of developing better systems.

There was further indication of this in Part II. Contrary to the overall trend there were a number of subjects who did quite well on 2 and 3 showing no decriment over 1. Every subject who fell into this category reported in the inquiry following Part II that they had a strong system which enabled them to make the said-imagined differentiation.

Given that a subject has a system which is completely capable of determining said from imagined in this specific experimental situation, then he would have no need of learning a new system because he has one which already works. For this subject it would be postulated that he would not follow the loud-soft cues for he has no reason to. The learning situation of Part II should only produce results on subjects who do not have such a system. Further, one factor in the degree to which subjects would follow the loud-soft cues should be the degree to which they already have a system which works in making the said-imagined discrimination.

The ability of the realize-false group to be certain with regard to whether at least some of the words were said or imagined would indicate that with this group there is some kind of system operating. Consequently, it would be ex-

pected that the realize-false group would be less influenced by the loud-soft cues than the not-realize-false group. This was true as the difference between the first and third trials was -1.19 for the realize-false group, and -2.77 for the not-realize-false group. Though not the only factor in these results, the influence that systems had in subjects' accuracy in Part II is quite clear.

It would then be expected that with the subjects who showed the least evidence of a system, but did realize the loud-soft pattern of the cues, they would show the most marked change between Trials 1 and 3. Of the categories created from the inquiry this would correspond to the pattern, not realize-false group. With this group the decline in accuracy from Trial 1 to Trial 3 was 7.2 to 2.3 as compared with 7.95 to 6.23 overall. Obviously, where subjects were unable to develop a system which enabled them to be certain of whether they said or imagined any of the words, then if they were able to recognize the pattern of the loud-soft cues in relationship to what the experimenter said they did, they were not simply influenced by these false cues, they were almost completely reliant upon them. Three subjects in this group did in fact follow the false cues completely.

There was another factor present in Part II which could have been responsible for the decrement in accuracy from Trial 1 to Trial 3. This was the fact that on the last two trials the experimenter's statements as to which words

were said, which imagined, were false. It is possible to hypothesize that the resulting confusion from these misleading statements could have caused the drop in accuracy. Though this hypothesis cannot be disproved, there is strong evidence that the experimenter's misleading statements, in and of themselves, had minimal or no effect on subjects' accuracy. There were four cases where subjects said they noticed no change of voice whatsoever during the recall. These subjects were therefore vulnerable to the above confusion but not, according to their report, to the influence of the loud-soft cues. For these four cases subjects' accuracy rose from 7.25 to 8.5 from Trial 1 to Trial 3. In each of these four cases subjects' accuracy was either the same or higher between the first and third trials. This was true for only 11 out of 40 subjects overall. The probability of the above occurrence is approximately .003. Consequently, it is reasonably safe to conclude that the significant overall drop in accuracy from Trial 1 to Trial 3 was due exclusively to the influence of the loud-soft cues.

The aim of Part II was to show that subjects' choices as to whether a given word was said or imagined could be influenced by information available only at the time of recall. The above results leave little question that such influence is in fact possible. What also seems clear from these results is that the degree to which subjects could

be influenced by this later information appeared to be a function of the effectiveness of the methods of differentiation that they already possessed.

It was hypothesized here that the memory differentiation of real from imagined is a judgement based on a learned ability to recognize characteristics of a given memory which are reliable indices of whether the memory was real or imagined. These would include the actual memory of an event's having been real or imagined, which this thesis maintains does not exist. The results of Part II indicate that such a model of learning real from imagined based on evidence other than the actual memory of real or imagined can exist. This was seen in Part II where subjects were willing to abandon all the evidence of their own memories to rely on cues which were in fact wrong.

CHAPTER IV

CONCLUSION

The Sameness of Real and Imagined Memories

The major hypothesis of this research is that the memories of real and imagined memories are the same, that memories at some basic level of storage lack the distinction between real and imagined, further, the everyday conscious distinction of real from imagined in memory is a learned ability to judge the distinction between the two on the basis of their usual characteristics.

The experiment described here attempted to investigate this hypothesis by creating a situation where the usual cues that individuals utilize in order to make the real-imagined memory differentiation were absent. In this situation the only difference between two events was that one was real, the other imagined. In such a situation it was hoped that it would be possible to demonstrate both that real and imagined appear the same in memory and also in what ways despite their sameness they can nonetheless be differentiated.

This experiment in no way constituted a proof of the

sameness hypothesis. To do such was at th s point probably impossible and certainly beyond the scope of this research. What this research did seek to do was to present varied experimental results all of which would suggest the validity of the sameness hypothesis. It is contended here that the experimental results previously discussed did in fact present a strong argument in favor of the sameness hypothesis.

Systems

Since supposedly in the experiment the normal systems for differentiating real from imagined were rendered inoperable, if subjects were to make the differentiation they had to utilize new svstems that would operate effectively in the specific experimental situation. The interest of this thesis was not so much the nature of these systems as the fact of their presence. This is particularly so since the experiment was designed to eliminate specifically those systems which are most widely present in everyday life.

What was quite evident from the experimental results was that the subjects did employ systems. Of the 40 subjects, 39 reported using some kind of system.[1] These results were a necessary correlate to the sameness hypothesis, for if it is true that real and imagined are the same in memory, then

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[1]The one subject who answered no to the question about using systems, did in fact describe the use of systems, similar to those used by other subjects in the earlier inquiry parts. Consequently there were no subjects who reported simply relying exclusively on their memories of whether a given word was said or imagined.

since individuals can and did in the experiment differentiate between them, there must exist methods whereby the two can be differentiated. The existence of such systems was clearly shown in the experiment.

The subjects' answers to the question, "How do you know that...?" did not produce hard evidence of the existence of the postulated phenomena. Yet it was these answers which produced most vividly the picture of the very process which is hypothesized here, as was most evident from both the failure of subjects to differentiate said and imagined and their need of creating methods to nonetheless make this differentiation. What was constantly lacking from subjects' responses was any sense that they actually felt that they could remember whether they said or imagined a word, one clearly differentiated from the other. What was definitely present was the need and ability to make systems which subjects with varying degrees of success were able to utilize in making the said-imagined differentiation.

Reality as a Judgement

The concept that the perception of reality is actually a judgement runs throughout this thesis. The subjects in Part II who did follow the false cues cannot really be said to have perceived the words to have been said or imagined, only to have judged. Yet it is contended here that what in everyday life is experienced as a perception is really a

judgement. In Part II subjects judged certain words to have been said or imagined. What must be postulated is that there is a time in development, probably early in childhood, where a constantly practiced judgement comes to be experienced as perception, where the judgement becomes "automatic" in such a way that it is no longer experienced as a judgement. This thesis cannot delve further into this issue but must be content with recognizing that between judgement and perception there is a gap, which this thesis nonetheless maintains is somehow bridged in the process of the learning of the differentiation of real from imagined.

Lists

At the beginning of this paper different means were postulated whereby individuals can differentiate between real and imagined, despite their sameness. As this research dealt with a highly specific experimental situation, the means whereby subjects differentiated said from imagined were not expected to produce much understanding of the ways individuals normally differentiate real from imagined in everyday experience. The inquiry did reveal a number of specific methods that subjects employed in making the said-imagined differentiation and which were elaborated here previously. Though for the most part these methods do not seem to show much similarity to any of the ways spoken of in the first chapter, there is perhaps one notable exception.

In the experiment the most effective system for differentiating said from imagined that was developed by subjects was that of making lists. Here subjects would build up lists of either the said or imagined words through repetition or special attention, ignoring the others. On the surface this method though effective, would seem to be particularly specialized, fit only for the specialized situation created by the experiment, or ones similar to it. It is, however, conceivable that there is something in the lists system which does have an everyday counterpart. This would be that perhaps one way that individuals differentiate in memory between real and imagined is by a method whereby somehow only one, either real or imagined is attended to, the other ignored. Usually, but perhaps not always, this would be the events which were real. Those events which were imagined in some way would not be attended to, in some way ignored or discounted.

In Chapter I it was sugtested that one method whereby individuals tell real from imagined is whether a given event can be placed in a context with other remembered events which are judged real. If so, it is judged real, if not, it is judged imagined. This context was described as a kind of sequence, itself identified as real by being part of a larger overall sequence, "That of my life which is real." The question posed here is whether these sequences are not in fact comparable to the lists where individuals learn to

ignore the imagined and build up a list of the real events in their lives. Further that perhaps this process whereby subjects would try to determine whether they had said or imagined a given word by looking back over their list is comparable to the everyday system of remembering an event and then looking back over various groups of associated memories, sequences, to see if the event fits in. One further piece of evidence in support of this idea is the number of subjects who utilized the lists system in the experiment. Out of forty subjects thirty indicated that they at some point in the experiment employed a system which involved making a list of either said or imagined, ignoring the other. The implication of this is that perhaps the reason that so many subjects used this system is that it was not an unfamiliar one, that it was one which was already an integral part of their own regular system for differentiating real from imagined.

Trace and Schema

Earlier in this paper a tentative definition of the memory trace was presented. The trace was viewed as the veridical but not necessarily complete replication of an event at the time of its occurrence. This definition coincided with the assumption throughout this paper that there was a memory trace. At this point it becomes necessary to define as specifically as possible the exact

nature of this memory trace.

When using the term "trace" what is meant here is some kind of record in the brain that is layed down at the time of an event's occurrence and refers specifically to that event. This differs from the concept of memory where each event only activates already present psychic representations and where each psychic event does not create a new entity but rather only activates old ones. In the experiment done here the perception of real or imagined was seen as part of a final conscious memory but not a part of whatever record subjects had from the time of the event's occurrence. These records though specific to the given event lacked any indication of reality. As the judgement of real or imagined pertaining to a given remembered event is seen here as based at least in part on information available which refers back to the time of the event's occurrence, it is necessary here to postulate an entity which does refer back to a specific event, and this would be the trace. To an extent this follows Paul's argument for a trace where he saw the need for something to account for the recall of the particular, where here the particular becomes the particular instance.

The classic image of the trace follows the productions of Penfield's temporal lobe stimulations where the trace is seen as a full stored replay of an event. It is not necessary that the trace envisioned here follow this model at all. Neisser (1969) was very much against this conception,

calling it the, "Reappearance Hypothesis (1969, p. 281)." He argued for a record which was not a facsimile of an event, but rather a product of the process whereby the event was perceived. This memory trace he envisioned as being similar to the bone fragments used by a paleontologist to construct a complete dinosaur, that is, instructions how to recreate rather than a recreation itself. This trace would then be a psychic record specific to a given instance, the main requirement for the trace, but in no way a total record of the event.

In the experiment if a word was judged to have been said, the subject would say, "I said it." If the word was judged to have been imagined, the subject would say, "I imagined it." Hence the judgement of real or imagined determined which of the two alternative pieces of behavior would be enacted. In this same way the judgement real or imagined functions as a determinant between two alternative pieces of behavior with regard to any given memory. The judgment real or imagined becomes an action mediator. This concept of an either-or decision linked to alternative behaviors follows the model of the information "bit" employed in the computer models of human information processing. Miller (1956) refers to the "bit" as the minimal unit in information processing. The bit, according to Miller, is "the amount of information that we need to make a decision between two likely alternatives (1956, p. 82)." The judge-

ment real or imagined would then correspond to a single bit of information, upon which alternative plans of action are chosen.

Whether a given conscious memory is experienced to be real or imagined would be dictated by the information bit which houses the two alternatives real or imagined. The bit realness would be in a sense a processing unit which at one end receives varied memories and screens them to determine whether they are real or imagined and at the other end, based on how the memory is judged, directs alternate behaviors. The bit realness would be itself the representation of a concept based on a meaningful and useful categorization of that which makes up an individual's experience of his word. Real or imagined functions as one way of classifying experience such as to order it and make meaningful behavior possible. As such it must have some kind of structural reality and it must in some way be able to screen remembered events and direct behavior.

Of the schema theories discussed previously the above model of reality most clearly resembles those of Piaget and especially Hebb. Piaget envisioned the schema as representing a specific piece of generalizable behavior. For Hebb the schemata were concept-like representations of external reality. Both views are compatable with the above concept of reality. Piaget emphasized the behavior directing role of the schema, Hebb more the screening,

interpreting schema function. Both Hebb and Piaget saw the schemata as being built up over time as a product of the interaction between an individual and his environment. Since realness is viewed here as a learned judgement built up over time, this would coincide with the above image of the schema as growing through interaction.

Both Piaget and Hebb viewed schemata as being possessed of different levels of complexity. Piaget emphasized the development of different levels of schemata in accord with different levels of intellectual development. Hebb proposed two separate types of schemata, the cell assembly which developed first, and the phase sequence which was made up of cell assemblies. The schema is then viewed as potentially existing at different levels with conceivably quite different structures.

Finally there is the concept of the schema as being triggered by an appropriate fit, which was basic to the schemata of Hebb and also of Bartlett. This concept is necessary as whether the judgement real or imagined is activated is seen here as depending on how the information in recall fits the schema.

In Part II of the experiment subjects based what they judged was said or imagined on the experimenter's cues. Aside from the demonstration of the realness judgement according to a learning model, what was indicated was that the realness judgement could be based on stimuli wholly

separate from the memory of the actual event. The implication and what is being maintained here is that the schema realness and the trace of the original event are wholly different in structure and function and totally separate.

The nature of the interaction between trace and schema is more speculative. A given event is seen as laying down a trace record at the time of its occurrence. This record is viewed here as referring to the given event and as a basis for the event's reconstruction, but not necessarily as a reproduction of the event. In recall this trace record is then in some way activated. Whether there is anything between the trace and the reality schema is not clear. The judgement of reality in a given memory seems to be based on the evidence of various attributes in the memory. Consequently, the existence of these attributes as part of the memory must necessarily precede the addition of real or imagined to the memory. These attributes in many instances might have to be already quite detailed and developed. For example, if a memory is judged imagined on the basis of its being highly improbable, such as a memory of elephants in the backyard, there must already exist prior to the real or imagined judgement a fairly complete memory of elephants in the backyard. It is conceivable that this memory of elephants in the backyard is itself the basic memory trace of the event. However, what is also conceivable, and is consistent with the line which has been followed here is

that the memory of elephants in the backyard is not the trace memory, but rather is itself a product of trace and schema, where conceivably the schema involved would be the schema for an elephant, the schema for the backyard or any other specific components of the memory. That is, between the trace record and the reality schema may lie other schemata of a possibly very different order than that of reality schema, which, triggered by the trace and with the addition of the reality schema, make the final conscious memory.

The sameness of real and imagined memories becomes defined by the above conception. Realness is seen as a memory attribute which becomes part of a conscious memory only at the time of recall. At that time one of the alternatives, either real or imagined is activated and becomes part of the memory. Before that time these alternatives, themselves comprising the concept realness, are seen as existing in the brain, but quite separate from any specific memory.

The sameness of real and imagined memories then refers to memories without realness, that is memories to which real or imagined have not yet been added on. Conscious memories do possess realness, but this realness is added on at the time of recall. What then are these memories without realness? Just prior to the addition of realness according to what is proposed here, there must exist some kind of memory

in a form fairly close to that of the final conscious memory but without an indication of reality. It is not clear whether this pre-realness memory is itself a stored record of an event, or rather, as has been assumed here, a product of some kind of trace plus other qualities contained in schemata which elaborate the trace record of the event in recall much in the same way as does realness, but at a prior level.

This means that there would be at least two kinds of pre-realness memories. One would be the record of the event layed down at the time of its occurrence. The other kind would be the memory that exists just prior to the addition of the schema reality which would itself be a product of the trace and schema. This pre-realness memory would be similar to the final conscious memory in that it also would only come into existence at the time of recall, as a synthesis of its various components.

The sameness of real and imagined memories then becomes complex. There may be at least two levels of memory with no indication of reality, plus a third, the final conscious memory which is perceived as real or imagined. The research carried out here deals with only two levels, the final conscious memory which possesses the indication of reality and a record connected with the original event which does not. The possibility of additional levels is discussed here to emphasize the probability that memory is a multi-

level process where the final conscious memory is not a stored replica of an event but a complex synthesis based on the interaction of many conceivably quite different components.

Conclusion

All that has been discussed here thus far has pertained to memory. It has been only with regard to memories that the issue of the sameness of real and imagined has been raised. Earlier the experiments by Perky and Segal were described which dealt with the differentiation of real from imagined with regard to perceived images. These experiments closely paralleled the experiment done here except that they dealt with perception rather than memory.

This paper has referred to the "final conscious memory" which has been viewed here as the synthesis of a stored trace which refers to a given event and stored schemata which elaborate the trace but have no connection with the given event. This final conscious memory is then not a memory in the usual sense in that it is not something stored. It only comes into existence, it is only created, at the time of recall. It is perhaps more aptly a thought which is the product of the process of remembering than some entity totally different from all conscious thought. As has been indicated in Part II of the experiment, memory attributes need not even be a product of past events.

What is being implied here is that the complex synthesis that has been described here for remembering conceivably applies not only for memories but for all conscious thought as well. More specifically with regard to realness, this would mean that the perception of realness with regard to all thought, memory or perception, is a learned judgement made at the time the given thought is brought to consciousness.

Neisser (1969) makes a similar equation of all conscious thought. He further proposes a system of remembering and perceiving quite similar to the synthesis described here. Neisser sees conscious thought as originating with stimulus information from sources either internal, as would be the case with memory, or external. For Neisser the stimuli as they are attended to become part of a synthesis which has as a final product the conscious thought, either memory or perception. Following the same line as this thesis, much of the final conscious product is, for Neisser, a function of scored information, other than the original stimulus. "The course of synthesis is partly determined by stimulus information, but it also depends on such factors as past experience, expectation, and preference (p. 301)."

Neisser goes further with his hypotheses and attempts to make a parallel with the psychoanalytic concepts of primary and secondary processes. Neisser postulated two

levels of information organization. The first of these was comparable to the preattentive processes of visual perception, the second to focal attention. These he equated with primary and secondary process. According to Neisser the preattentive process, the first level of information processing, is rather global and is based on quite crude stimulus properties. It is not selective and deals with all available stimuli. The preattentive process holds stimuli only briefly and if they are not further processed they are lost. Neisser's secondary process, focal attention, is that which attends to specific stimuli and constructs from these gross stimuli the sophisticated final products which make up conscious thought. Though generally in keeping with what has been discussed previously in this thesis, the above conception does fall short of completely accounting for the results of this thesis.

The judgement real or imagined has been viewed here as added onto a memory on the basis of information connected with or part of the memory. The example of a pre-realness memory given earlier was that of a memory of elephants in the backyard. Though not yet possessed of the attribute real or imagined, this is a memory of a degree of specificity of form and of content that in no way corresponds to the gross images described by Neisser as products of the preattentive process. Rather the memory of elephants in the backyard

would more correspond to the products of his secondary process elaboration, yet without real or imagined this memory cannot be considered the final conscious product. In short, Neisser's two levels of information processing, with regard to the results of this research are not enough.

What is required here is that in the process of the construction of a conscious memory, a construction which must be viewed at least in part as linear, there is a point at which the attribute realness is added on to a memory, where the memory has already attained a form close to the final conscious product. With this pre-realness form there is already a degree of organization much more characteristic of the secondary rather than the primary process. This means that up until the last moment prior to coming to consciousness, realness remains separate from any given memory and perhaps any given thought. Conceivably there are concepts other than realness, time perspective might be one, which as a class exist quite independently as learned judgements only becoming part of thought at the time of coming to consciousness.

One final implication which will be mentioned here is that any system of thought below or prior to consciousness will obviously be without any indication of reality as well as the other comparable learned concepts, whatever they may be. The unconscious is depicted as a system of thought, below consciousness, which among other characteristics has

no indication of reality. Clearly, according to this thesis the unconscious could have no indication of reality because the qualities real or imagined only become part of conscious memory just prior to consciousness. In the process here of attempting to describe the construction of a conscious memory it becomes apparent that much about the unconscious can be understood by understanding the various components of conscious thought. This thesis has emphasized that remembering is a constructive process. However, perhaps most importantly, by focusing on realness, this thesis has viewed conscious thought as a synthesis of various components, making conscious thought itself a subject for analysis.

APPENDIX

Oral Introduction to Subjects

(Subjects will be paid prior to the beginning of the experiment.)

This is an experiment in certain aspects of remembering. In general it will consist of various memory tasks that will be presented to you. Your name will not be attached to the data resulting from your participation in this experiment. Before we begin do you have any questions?

(All questions will be answered as fully and accurately as possible. The exception will be questions asking more detail about the experiment itself and subjects will be requested to wait until the actual presentation of the experiment at which time they will have the opportunity to have anything that they do not understand clarified.)

Instructions and Inquiry, Part I

Instructions will be presented as follows where the sequence of the various conditions is IA, IB, IC, II. Instructions will vary slightly for the other sequences. These differences will be specified at the end of this set of instructions.

Condition IA

I am now going to read to you a list of ten different words. Before each of the words I am going to say either the word "say" or the word "imagine."

After each word I want you to actually say or imagine the word, depending on whether I say "say" or "imagine" before it. When I ask you to say a word I want you to say the word out loud immediately after I say it. When I ask you to imagine a word, I want you to again imagine right after I say the word that you are saying it, but do not say it. Do not move your mouth or tongue or teeth but imagine as if you are saying the word without actually speaking. Make sure that you do this for every word that I ask you to imagine.

After we have gone through the list of ten words I will then read each word back to you, one at a time. I will ask you whether you said or imagined the word in question. For example, I would say, "Say door, imagine chair, say car," until I had completed a list of ten. Then I would read each word back to you, for example "car" and you would tell me whether you said or imagined the word "car." Is this clear?

(If the subject responds positively, the test will begin. If not, questions will be answered to clarify the procedure.) Then we will begin.

(Words will be presented with approximately 4 seconds for each presentation.)

Now I am going to read the words back to you, one at a time. After I say each word I want you to tell me whether you think you said or imagined the word. If you are not sure, still try to answer so that you will have responded for each word.

(The words are read back.)

Inquiry

I am now going to ask you some questions about the list we just finished. Answer these questions as fully as possible. Please do not omit any thoughts which may occur to you.

(The experimenter will then ask the following for the three randomly chosen words and for what other words, if any, he has also chosen as needing inquiry.)

How do you know that you (said, imagined)...?

(If further elaboration is desired the experimenter will either repeat what the subject said or ask, "Could you explain that more fully?")

Presentation (second trial)

Now I will again read to you the list of ten words prefaced by either "say" or "imagine" and I want you to again either say or imagine saying the given word.

Recall (second trial)

(Following a 4-second pause.)

All right.

Inquiry (second trial)

This and all other inquiries will have no introduction and will simply begin by asking, "How do you know that you (said, imagined)...?

Presentation (third trial)

Now I will again read to you the list of ten words prefaced by either "say" or "imagine" and I want you to again either say or imagine saying the word.

Recall (second trial)

(Following a 4-second pause.)

All right.

Inquiry (second trial)

This and all other inquiries will have no introduction and will simply begin by asking, "How do you know that you (said, imagined)...?

Presentation (third trial)

Now again we will do a list of ten words with you either saying or imagining them.

Recall (third trial)

All right.

Inquiry (third trial)

Condition IB

This time there will be a change in the procedure. I will again read the list of ten words. However, this time each word will be prefaced by either the word "say" or the word "picture." As before, when I say "say" I want you to say the word immediately after I say it. However, when I say "picture," I want you to make a mental picture of what I am saying. So, if I should say, "Picture 'chair'," you would immediately make a mental picture of a chair. If I were to say "picture 'tree'," you would picture a tree. Only make these pictures for the words I say to picture. After the ten words I will ask you which you said and which you pictured. Is this clear?

Recall.

All right, now I want you to tell me whether you said or pictured each word.

Inquiry

Presentation (second trial)

Now I will again read to you the list of ten words prefaced by either "say" or "picture" and you are, as before, to either say or picture each word.

(There will be a 4-second pause.)

Recall (second trial)

All right.

Inquiry

Presentation (third trial)

Now I will again read to you the list of ten words which you are to either say or picture.

(There will be a 4-second pause.)

Recall

All right.

Inquiry

Condition IC1

This time we are again going to follow a somewhat different procedure. Again I will read to you a list of ten words, prefacing them by the words "say" or "imagine." This time do not say or do not imagine the words in this trail. You are simply to listen to what I say. When I have completed the ten words I will read them back to you and you will be asked to remember whether I said, "say," or "imagine," before each word. Is this clear?

(If the subject responds positively, the test will begin. If not, questions will be answered to clarify the procedure.) Then we will begin.

(Words will be presented with approximately 4 seconds for each presentation.)

Now I am going to read the words back to you, one at a time. After I say each word I want you to tell me whether you think I said "say" or "imagine" before each word.

(The words are read back.)

Condition IC2

Now I am again going to read to you the list of ten words, but this time they will be prefaced either by the word "say" or the word "picture." Again I will read the words back to you one at a time and you are to say whether I said "say" or "picture" before each word.

(The words will again be presented.)

Recall

All right, I want you to tell me whether I said "say" or "picture" before each word.

(The words are read back.)

Instructions and Inquiry, Part II

We will again follow the previous procedure where I presented the ten words preceded by either "say" or "imagine" and you are either to say or imagine the words, as instructed. There will, however, be a difference in the recall procedure which will be explained after we have completed the word list. Remember that when I say imagine, you are to immediately imagine saying the word, do not make a picture of it.

Recall (first trial)

I will now read the words back to you and you will tell me whether you said or imagined each word. This time,

however, after you have responded for each word, I will tell you whether you actually said or imagined the given words.

No Inquiry

Presentation (second and third trials)

Now I will again read to you the ten words for you to either "say" or "imagine."

Recall (second and third trials)

Again I want you to tell me whether you said or imagined each word and I will say what you actually did.

Inquiry (after third recall)

How were you able to know which words you said or imagined on this last trial?

(For subjects who indicate no recognition of the loud-soft cues): Did you notice anything about my tone of voice?

(For subjects who do indicate recognition of the loud-soft cues): When in these last trials did you first notice the changing in my tone of voice?

(For all subjects): Did you realize on these last two trials that what I said you had done was directly the opposite of what you actually did?

(For all subjects): On the trials where you were asked to differentiate between what you said and what you imagined, in differentiating the two did you have any system that you thought helped you?

(For all subjects): Of the two tasks, differentiating between saying or imagining or between saying and picturing which do you feel was the most difficult?

(For all subjects): On the trials where you were asked to imagine saying the words, did you find yourself picturing them?

Differences in Instructions for Other Sequences

Added to the instructions for when Condition IA follows Condition IB is the following.

When I say imagine, do not make a picture of what I say but simply imagine saying the word.

Deleted from the instructions for when Condition IC precedes Condition IA is the following:

This time do not say or do not imagine the words in this trial. You are to simply to listen to what I say.

Condition IA

Trial 1

Presentation

number	say or imagine	
____	____	cow
____	____	horse
____	____	cat
____	____	dog
____	____	pig
____	____	duck
____	____	hen
____	____	deer
____	____	bird
____	____	goat

Inquiry

randomly picked words

_____
_____
_____

other words

_____
_____

Recall

number		subject's response
____	cow	____
____	horse	____
____	cat	____
____	dog	____
____	pig	____
____	duck	____
____	hen	____
____	deer	____
____	bird	____
____	goat	____

Trial 2

Presentation

number	say or imagine	
____	____	cow
____	____	horse
____	____	cat
____	____	dog
____	____	pig
____	____	duck
____	____	hen
____	____	deer
____	____	bird
____	____	goat

Inquiry

randomly picked words

_____
_____
_____

other words

_____
_____

Recall

number		subject's response
____	cow	____
____	horse	____
____	cat	____
____	dog	____
____	pig	____
____	duck	____
____	hen	____
____	deer	____
____	bird	____
____	goat	____

Condition IB

Trial 1

Presentation				Recall	
number	say or picture			number	subject's response
____	____	cow		____cow	____
____	____	horse		____horse	____
____	____	cat		____cat	____
____	____	dog		____dog	____
____	____	pig		____pig	____
____	____	duck		____duck	____
____	____	hen		____hen	____
____	____	deer	Inquiry	____deer	____
____	____	bird		____bird	____
____	____	goat	randomly picked words	____goat	____

_____
_____
_____

other words

_____
_____
_____

Trial 2

Presentation				Recall	
number	say or picture			number	subject's response
____	____	cow		____cow	____
____	____	horse		____horse	____
____	____	cat		____cat	____
____	____	dog		____dog	____
____	____	pig		____pig	____
____	____	duck		____duck	____
____	____	hen	Inquiry	____hen	____
____	____	deer		____deer	____
____	____	bird	randomly picked words	____bird	____
____	____	goat		____goat	____

_____
_____
_____

other words

_____
_____
_____

Condition IA

Trial 3

Presentation

number	say or imagine	
____	____	cow
____	____	horse
____	____	cat
____	____	dog
____	____	pig
____	____	duck
____	____	hen
____	____	deer
____	____	bird
____	____	goat

Inquiry

randomly picked words

_____
_____
_____

other words

_____
_____

Recall

number		subject's response
____	cow	____
____	horse	____
____	cat	____
____	dog	____
____	pig	____
____	duck	____
____	hen	____
____	deer	____
____	bird	____
____	goat	____

Condition B

Trial 3

Presentation

number	say or picture	
____	____	cow
____	____	horse
____	____	cat
____	____	dog
____	____	pig
____	____	duck
____	____	hen
____	____	deer
____	____	bird
____	____	goat

Inquiry

randomly picked words

_____
_____
_____

Recall

number		subject's response
____	cow	____
____	horse	____
____	cat	____
____	dog	____
____	pig	____
____	duck	____
____	hen	____
____	deer	____
____	bird	____
____	goat	____

Condition IC

Presentation			Recall	
number	say or imagine	IC1	number	subject's response
____	____	cow	____cow	____
____	____	horse	____horse	____
____	____	cat	____cat	____
____	____	dog	____dog	____
____	____	pig	____pig	____
____	____	duck	____duck	____
____	____	hen	____hen	____
____	____	deer	____deer	____
____	____	bird	____bird	____
____	____	goat	____goat	____

IC2

	say or picture			
____	____	cow	____cow	____
____	____	horse	____horse	____
____	____	cat	____cat	____
____	____	dog	____dog	____
____	____	pig	____pig	____
____	____	duck	____duck	____
____	____	hen	____hen	____
____	____	deer	____deer	____
____	____	bird	____bird	____
____	____	goat	____goat	____

Part II

Trial 1

Presentation

number	said or imagined	
____	____	cow
____	____	horse
____	____	cat
____	____	dog
____	____	pig
____	____	duck
____	____	hen
____	____	deer
____	____	bird
____	____	goat

Recall

number		subject's response
____	cow	____
____	horse	____
____	cat	____
____	dog	____
____	pig	____
____	duck	____
____	hen	____
____	deer	____
____	bird	____
____	goat	____

Trial 2

Presentation

number	said or imagined	
____	____	cow
____	____	horse
____	____	cat
____	____	dog
____	____	pig
____	____	duck
____	____	hen
____	____	deer
____	____	bird
____	____	goat

Recall

number		subject's response
____	cow	____
____	horse	____
____	cat	____
____	dog	____
____	pig	____
____	duck	____
____	hen	____
____	deer	____
____	bird	____
____	goat	____

Trial 3

Presentation

number	said or imagined	
____	____	cow
____	____	horse
____	____	cat
____	____	dog
____	____	pig
____	____	duck
____	____	hen
____	____	deer
____	____	bird
____	____	goat

Recall

number		subject's response
____	cow	____
____	horse	____
____	cat	____
____	dog	____
____	pig	____
____	duck	____
____	hen	____
____	deer	____
____	bird	____
____	goat	____

Inquiry

TABLE 3

MEAN ACCURACY SCORES FOR ALL SUBJECTS FOR IC1 and IC2 (N=40)

	Mean	s.d.	Number of Trials
IC1	7.40	1.93	40
IC2	7.15	2.01	40

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
IC1 and IC2	1	1.25	.30	n.s.
Subjects	39	4.28		
Interaction	39	4.22		
Total	79			

TABLE 4

MEAN ACCURACY SCORES FOR ALL SUBJECTS FOR THE THREE TRIALS OF CONDITION IA

	Mean	s.d.	Number of Trials
Trial 1	7.18	1.58	40
Trial 2	7.53	2.37	40
Trial 3	7.37	1.87	40

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Trials 1, 2, & 3	2	1.23	.23	n.s.
Subjects	39			
Interaction	78	5.28		
Total	119			

TABLE 5

MEAN ACCURACY SCORES FOR ALL SUBJECTS
FOR THE THREE TRIALS OF CONDITION IB

	Mean	s.d.	Number of Trials
Trial 1	8.33	1.46	40
Trial 2	8.15	1.43	40
Trial 3	8.18	1.78	40

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Trials 1, 2, & 3	2	.36	.41	n.s.
Subjects	39	5.97		
Interaction	78	.88		
Total	119			

TABLE 6

MEAN ACCURACY SCORES FOR ALL SUBJECTS FOR THE TWO TRIALS OF CONDITION IC

	Mean	s.d.	Number of Trials
Trial 1	6.925	2.14	40
Trial 2	7.625	1.91	40

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Trials 1 & 2	1	9.55	2.38	n.s.
Subjects	39			
Interaction	39	4.01		
Total	79			

TABLE 7

MEAN ACCURACY SCORES FOR ALL SUBJECTS ON TRIALS 1, 2, 7 AND 8 (N=40)

	Mean	s.d.	Number of Trials
Trial 1	7.50	1.77	40
Trial 2	6.88	2.58	40
Trial 7	7.83	1.92	40
Trial 8	7.68	1.20	40

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Trials 1, 2, 7 & 8	3	4.38	1.79	n.s.
Subjects	39			
Interaction	117	2.44		
Total	159			

TABLE 8

MEAN ACCURACY SCORES FOR ALL SUBJECTS ON TRIALS 3, 4, 5 AND 6 (N=40)

	Mean	s.d.	Number of Trials
Trial 3	8.05	1.53	40
Trial 4	8.10	1.45	40
Trial 5	7.75	2.01	40
Trial 6	7.63	1.20	40

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Trials 3, 4, 5 & 6	3	2.12	.86	n.s.
Subjects	39			
Interaction	117	2.47		
Total	159			

TABLE 9

MEAN ACCURACY SCORES FOR THE TWO SEQUENCES:
IC1, IC2 AND IC2, IC1--TWENTY SUBJECTS FOR EACH SEQUENCE

	Mean	s.d.	Number of Trials
IC1, IC2	7.59	1.96	160
IC2, IC1	7.73	1.86	160

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Between	1	84.1	1.825	n.s.
Within	38	46.195		
Total	39			

TABLE 10

MEAN ACCURACY SCORES FOR PART IA FOR THE FOUR SEQUENCES--TEN SUBJECTS FOR EACH SEQUENCE

	Mean	s.d.	Number of Trials
IA, IB, IC	7.87	2.54	30
IB, IA, IC	7.53	1.29	30
IC, IA, IB	7.03	1.90	30
IC, IB, IA	6.97	2.10	30

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Between	3	16.43	1.27	n.s.
Within	36	12.96		
Total	39			

TABLE 11

MEAN ACCURACY SCORES FOR CONDITION IB FOR ALL SUBJECTS FOR FOUR DIFFERENT SEQUENCES-- TEN SUBJECTS FOR EACH SEQUENCE

	Mean	s.d.	Number of Trials
IA, IB, IC	8.37	1.35	30
IB, IA, IC	7.80	1.49	30
IC, IA, IB	8.20	1.25	30
IC, IB, IA	8.50	1.98	30

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Between	3	4.97	.47	n.s.
Within	36	10.67		
Total	39			

TABLE 12

MEAN ACCURACY SCORES FOR CONDITION IC FOR ALL SUBJECTS FOR THE FOUR DIFFERENT SEQUENCES--TEN SUBJECTS FOR EACH SEQUENCE

	Mean	s.d.	Number of Trials
IA, IB, IC	7.95	1.86	20
IB, IA, IC	7.35	2.26	20
IC, IA, IB	6.60	1.81	20
IC, IA, IB	7.10	1.18	20

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Between	3	12.97	1.32	n.s.
Within	36	9.80		
Total	39			

TABLE 13

MEAN ACCURACY SCORES FOR ALL SUBJECTS FOR CONDITIONS IA, IB AND IC COMBINED FOR THE FOUR DIFFERENT SEQUENCES--TEN SUBJECTS FOR EACH SEQUENCE

	Mean	s.d.	Number of Trials
IA, IB, IC	8.08	2.01	80
IB, IA, IC	7.64	1.72	80
IC, IA, IB	7.34	1.68	80
IC, IB, IA	7.58	2.21	80

Analysis of Variance

Source of Variance	d.f.	M.S.	F	P
Between	3	60.57	.74	n.s.
Within	36	81.61		
Total	39			

TABLE 14

ANALYSIS OF SUBJECTS ERRORS
FOR CONDITION IA

Number of Subjects Who Said "Said" for Imagined	------	157
Number of Subjects Who Said "Imagined" for Said	------	161

N	Mean Difference	s.d.	p
320	4	8.86	n.s.

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