

THE EFFECT OF 'COGNITIVE STYLES'  
ON LEARNING

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## ABSTRACT

The present study derived its rationale from Shapiro's (1965) analysis of the 'neurotic styles'. It was his postulation that each of the four basic modes of neurotic functioning represents a specific 'style' or mode of cognition which influences perception, learning and memory. As such, they result in differentially identifiable behavioral characteristics. It seemed logical, therefore, that if as Shapiro assumes, the type of neurosis an individual develops is a function of the cognitive structure or 'style' of functioning that characterizes that particular individual, these differences in functioning should be apparent (but to a lesser degree) in a 'normal' population.

Ninety-six (96) subjects, therefore, were chosen to be members of the four groups (obsessive-compulsive, impulsive, hysteric and paranoid) based on their performance on prescribed subscales of the Personality Research Form (Jackson, 1967). It was assumed that performance on certain of the P.R.F. subscales was indicative of trait characteristics that were comparable to the four 'neurotic styles' that Shapiro (1965) had outlined.

Because the purpose of the study was to investigate any differences in learning and retention among the P.R.F. groups, a learning task was employed which would allow for a maximal amount of variability in functioning. For this reason, the learning task consisted of paired-associates which were presented in 2 lists (list 1 and list 2), learned under two learning conditions (imagery and repetition), composed of two types of learning materials (pictures and words) which were manipulated in terms of their abstractness and concreteness (Paivio 1967), and retained over

two recall conditions (immediate and delayed). It was assumed that by introducing variability into the learning task, a higher probability for differential functioning between the P.R.F. groups would be allowed for.

The results indicated that although overall differences in functioning between the groups were not significant, some differential functioning did occur. It was observed that in immediate recall significant sex differences were indicated; females outperformed their male counterparts in the obsessive-compulsive and impulsive groups, whereas, males outperformed their female counterparts in the hysteric and paranoid groups. In conjunction with this was the significantly superior performance of females over males in delayed retention. Other significant differences in functioning between the groups were observed in their performance on the lists in immediate recall. (The paranoid group showed an increase in recall across lists while the other three groups showed a decrease), and on the abstractness or concreteness of the items (in immediate recall the paranoid group recalled more abstract items whereas the other three groups recalled more concrete items). Sex appeared to be of major significance, the females significantly outperforming the males on almost all measures. As such, therefore, the results were presented in three ways: the independent interactions (P.R.F. group, sex, level), the dependent interactions (list, learning condition, learning material, abstractness-concreteness) and the independent x dependent interactions. By doing so the analysis of the results into the particular 'styles' of functioning was facilitated.

The analysis of the data by 'level' provided a rather interesting interaction which proved suggestive of a differential functioning between the groups as a function of 'cognitive style'. The finding that

there was a significant difference between the P.R.F. groups at the 'high' level with regard to learning and retention under the two learning conditions (I and R) on the concrete and abstract pictures and words was interpreted as being indicative of the influence of the different 'cognitive styles'. These differences in functioning were viewed as being supportive of Shapiro's (1965) conceptualizations regarding the functioning of each 'style'.

It was concluded that while no overall P.R.F. group differences were observable, the significant interactions that did occur were at least partially indicative of a differential functioning according to 'style'. It was posited that possible explanations for the failure to obtain overall P.R.F. group differences were in terms of methodological errors in the type of learning task employed as well as in the nature of the sample used. It was further postulated that if further research into the 'cognitive styles' is to be meaningfully pursued, an objective means of defining the 'neurotic styles' must be formulated.

In his book Neurotic Styles, Shapiro (1965) presents a rather descriptive analysis of four basic modes of neurotic functioning; impulsive, obsessive-compulsive, paranoid, and hysterical. It is his postulation that each of these four basic modes of functioning represents a specific 'neurotic style' or mode of cognition which effects perception, learning, memory, and in general, results in characteristic and observable behavioral manifestations.

Shapiro points out that the logic for such an assertion was derived from his consistent observation of differential responding by certain categories of patients on various psychological tests. In tests, particularly the Rorschach, ways of thinking and perceiving are the primary material from which inferences concerning diagnosis, defence mechanisms, and character traits are drawn. Thus, it seemed to Shapiro, that these ways of thinking that are revealed by Rorschach interpretation and which are ordinarily used by the psychologist to identify defence mechanisms, traits, and diagnostic syndromes, must in themselves represent psychological structures of importance. Further, these structures might be of a more general type than the specific traits or mechanisms that could be inferred from them. It seemed plausible, therefore, that mode of thinking or cognition might be one factor that determines the shape or form of symptom, defence mechanisms, and adaptive trait as well.

The simple fact of human consistency over broad areas of functioning would argue for such a concept, but this fact has a more specific clinical manifestation. It is generally accepted that symptoms or outstanding pathological traits regularly appear in contexts of attitudes, interests, intellectual inclinations and endowments, and even vocational aptitudes and social affinities with which the given symptom or trait seems to have a certain consistency (Reich, 1933). These consistencies in

an individual's functioning do not seem to be explainable as manifestations of specific drive contents; they are too broad and extensive for that. They are formal consistencies, consistencies of individual style which reflect cognitive functioning and give a characteristic 'style' to an entire range of behavior, from perception and thinking to the overt manifestation of these behaviors and memory. It was this consistency in behavior which led Shapiro to postulate the concept of 'style' and eventually cognition, as the underlying predeterminant in the development of the specific modes of neurotic functioning.

#### History of the Problem

Shapiro points out that this view of general forms or styles of functioning as a matrix for specific traits or symptoms touches on two problems which have figured significantly in psychoanalytic theorizing but which have never really been resolved satisfactorily. The first is the problem of the "choice of neuroses", that is, the problem of what factors dispose a given person to develop symptoms of a particular form; the second is the problem of understanding character. These two problems are, in certain ways, intimately related; in fact, they may easily be considered as different aspects of the same essential problem. That is to say, the disposition to one or another specific form of symptom may be regarded as essentially a problem of character, while on another level, character itself may be regarded as consisting of the configuration in an individual of just such general and relatively stable forms of functioning as were outlined earlier as being characteristic of an individual's behavioral style. Both these problems were viewed somewhat differently in the early days of psychoanalytic theory, however. As has often been pointed out, an initial interest of psychoanalysis was the study of

instinctual drives and their vicissitudes. Accordingly, the pathological symptom was studied chiefly in this aspect. The content of the specific symptom and not the general form of functioning was studied, and the problem of the choice of neurosis was one of identification of the drive content represented in the symptom and correlation of it with a developmental (psychosexual) phase. Beyond this, the question remained of establishing the reasons for the specific psychosexual fixation.

The limitations of such an approach seem inherently obvious; whereas some aspects of the neurotic symptom may be understood in this way, other aspects are not clearly traceable to the content of the original drive or the earlier drive conflict. Such an attempt to solve the problem of symptom choice exclusively on the basis of libidinal development, conflict, and fixation thus proved insufficient; too much information was being disregarded. In all fairness to Freud however, it must be pointed out that there does exist in these early papers some suggestion of the persistence of relatively general forms of behavior and experience which were not always clearly tied to symbolic representations of their original objects and which sometimes possessed considerable adaptive power (in other words, of the generalization of an instinctual mode into a broad style of functioning). However, these were only suggestions or incidental ideas and it is obvious that the main point and excitement of discovery remained in the identification of the antecedent drive(s): there was no purposeful discernible attempt to describe general ways of functioning that would comprise what we call character. Such an approach to character appeared later, in the character analyses of Wilhelm Reich (1933).

According to Reich, the neurotic solution of an infantile instinctual conflict is accomplished by a generalized alteration in functioning, ultimately crystallizing in a neurotic character, and this--

"character as a total formation", not merely specific defense operations or the content of specific traits--becomes the object of study, as it was for Reich the focus of therapeutic attention. He points out that, "Our problem is not the content or the nature of this or that character trait, but the origin and meaningful working of the typical mode of reaction in general" (p.144). The modes of reaction could not longer be described exclusively in terms of the earlier drive content for these character forms "cannot be derived from individual impulses like the contents of the character traits; they give the individual his particular stamp" (Reich, p.196). Reich emphasizes the fact that these are not only generalized forms of functioning, but also stable, even ossified ones. The ego is "hardened", defenses are consolidated in these forms, and earlier conflict is "transformed into chronic attitudes, into chronic automatic modes of reaction" (p.156). In this view, therefore, the modes of functioning are detached from the content of the infantile conflict, which is their presumed origin, and achieve, in this respect at least, an autonomy or independence from that original conflict, a feature that is critical to the concept of generalized forms of functioning.

Reich's formulations did not solve all of the inadequacies however. Despite his consideration of ego functions in the development of character, there remained two points which were still not accounted for. The first concerns the origin of the character form, and the second concerns its function. As such, Reich's failure can be seen as one of not taking the step of conceiving of general forms with a stable existence independent of defensive requirements or instinctual conflict. His scheme does not take cognizance of characteristic modes of functioning in the adaptive relationship with the external world or in expressiveness. It excludes, among the possible determinants of the shape of character or

character forms, the psychological equipment, capacities, or tendencies (such as various cognitive apparatuses and tendencies) that may have been present from the beginning (i.e., conception) and which are independent of instinctual conflict. Nor is there any indication, in this view, that external reality (particularly, early social reality) contributes in an essential way to the adaptive development of characteristic modes by way of its own opportunities, demands and forms. These possibilities were introduced later by Heinz Hartmann (1939, 1946, 1950, 1958) and Erik Erikson (1950, 1956).

Hartmann's (1939) major contribution lay in his positing of psychological structures independent of instinctual drives and drive conflicts; his was a postulation of a broader base than was available before for a picture of character development and the development of general forms of functioning. Thus, Hartman brought to the fore the significance for psychological development of constitutionally given mental endowments and apparatuses. He pointed out that these apparatuses comprise basic human adaptive equipment and form the nucleus of a sphere of adaptive psychological functioning that is relatively independent of instinctual conflict. Further, according to their individual distributions and special characteristics, these innate endowments and their maturational products not only influence the form or special tendency of later adaptive functioning, but also the form of or 'preference' for ways of handling conflict.

Erikson, (1950) expanding on Hartmann's postulations, offered an explicit picture of how this development proceeds, in certain areas at least. Erikson describes the progressive unfolding of general modes of functioning "patterns of going at things, modes of approach, modes of seeking relationships" (Erikson, p.65) along with psychosexual development,

in each phase modelled after the dominant instinctual mode but determined also by concurrently emerging motivational capacities and tendencies. The result of a developmental phase is not merely a matter of the fate of the instinct, but -- as the mode is crystallized into socially provided forms -- it is a way of functioning, an attitude, and a frame of mind. Thus in contrast to Reich's 'modes of reaction', the general forms of functioning in Erikson's scheme have three roots; instinctual development, the unfolding of motivational capacities and tendencies, and the external social forms that society provides at each developmental phase. It is from this general framework that Shapiro derived the basic theoretical rationale that underlies his conception of 'style'.

It seems important to emphasize at this time the theoretical progression or gradual unfolding of Freud's original postulates that is basic to all of the above approaches. With each extension from the original purely analytic approach, the analysis of character became more and more inclusive, and as such, was capable of describing the more molar aspects of individual functioning in a unique way. This gradual evolution and embellishment of analytic theory necessarily resulted in a more adequate characterology and consequently a more reliable analysis into particular 'styles'.

#### Shapiro's Theoretical Rationale

As pointed out above, it is basically from this evolution of conceptualization of the organism that Shapiro derived his conception of 'style'. Aiding him in his formulation, however, were the more recent findings of Klein (1954) and Gardner (1959) who had concerned themselves with cognitive functioning. It is in their work, which shared the same general theoretical orientation of Hartmann and Erikson, that a psycho-

logical and psychoanalytic concept of style of form of functioning was most clearly developed and applied.

Klein (1959) and Gardner (1959) had demonstrated the influence of motive or need on perception, showing that the relationship was not simple and direct, but instead was rather complex. Both these investigators had shown that motivational influences were different in different people, and furthermore, the nature of such influences or the particular directions they take are consistent for individuals through a variety of cognitive tasks and in various motivational states. Thus it was possible, in other words, to demonstrate that individuals possess relatively stable cognitive tendencies that determine the form of the influence that a motive or need exerts on their cognition. Klein (1959) points out that these cognitive attitudes "seem to reflect highly generalized forms of control, as likely to appear in a person's perceptual behavior as in his manner of recall and recollection" (Klein, p.89).

With this experimental evidence providing valuable support for his theoretical rationale, Shapiro was thus better able (both theoretically and experimentally) to derive a consistent approach from the diffuse yet complementary data which was to be found in all areas of psychological investigation. As such, a more 'plausible' position was offered.

Shapiro analyzed character style in terms of three major factors:

- 1) influence of genetic-constitution aspects
- 2) drive influences
- 3) ego functions

Shapiro points out that it is quite safe to say that the capacity, the psychological equipment, for the general functions described above (cognition, affective experience, and the like) is at least in a rudimentary way, provided for in the human constitution. The elements of this equipment

(sensory and perceptual apparatus, memory apparatus, some kind of affect or at least affect-like tension-discharge equipment,) seem to be operative from birth. It is apparent also, that individual variations in innate equipment are bound to influence the quality of the more developed functions in which it later participates, so they may be regarded as independent sources of individual styles. Thus, it is Shapiro's suggestion that a configuration of innate psychological equipment imposes some form and organization, however little differentiated it may be initially, on drives and external stimuli and, in general, on all psychological tensions. It is most important to realize that this innate apparatus imposes form and organization on the subjective experience of internal tensions and external stimuli from the beginning. Thus individual variations in such equipment imply variations in the experience of tensions and stimuli. Further differences, such as differences in 'anticipation capacity' and the perceptual equipment necessary for object recognition, also soon become involved in the process of subjective tension organization, tending in one case to cause drive tensions to be experienced in a more directed form and, in another case, in a more diffuse form, and so on. To the extent that there are innate organizing and form-giving configurations of psychological apparatus in the new born infant, he is not, as it were, purely a passive agent and his behavior is not immediately and totally dependent on biological drives or external stimuli. To this extent, therefore, one can properly speak of the beginnings of psychological style, of psychological functioning that is a product not of drives and stimuli alone, but also of the mental organizing processes of an individual.

The modification, development, and differentiation of the 'initial organizing configuration', thus, can be conceptualized as proceeding immediately under the influence of the external world it encounters as well

as continued motivation. All developmental influences, including both those that originate externally and those that arise internally, are initially organized according to the forms of functioning, the forms of subjective experience, cognition, and the like, that prevail at the time. Development in other words, always proceeds through the existing forms, and these forms themselves always develop, as it were, from the inside out, always through transformations and never additively.

Shapiro points out quite emphatically that the considerable significance of innate psychological equipment for the origins of psychological style in infants by no means necessarily implies equivalent or even comparable significance of innate factors for the fully developed and highly differentiated adult style. On the contrary, innate factors, can only be responsible for form tendencies of a very general and not a highly differentiated or specific kind. In general, the more specific the style feature, the less the innate responsibility for it. Shapiro posits as an example of this influence the possibility that sex differences may be a result of this factor. The fact that there is an overwhelming predominance of women among hysterical patients, whereas there is a relative predominance of men among obsessive-compulsives could be accounted for in terms of innate structural differences in mode of activity and cognitive attitude.

The next major factor influential in the development and formation of specific cognitive structures are the instinctual drives. Shapiro points out that "there can hardly be any question about whether instinctual drives influence the development of psychological style, but only in what ways and in what measure" (p.181). The unfolding of new drives with new urges and motivations, new potentialities of subjective experience, objects of interest, kinds of activity, and modes of activity (of Erikson, 1950) certainly have an impact on the existing fabric or configuration of mental

organizing forms. Thus, a drive impetus is experienced not only in terms of specific external factors but also according to the dimensions and qualities of subjective experience imposed by such factors as tension thresholds, degree of sucking readiness (according to which some infants seem to experience tension in a more directed form as sucking tension, whereas others give evidence of a more diffuse tension experience) and the like. This process could be described in essentially the same way for later stages of drive development and later stages of maturation in general. Later, in fact, when the existing style of functioning is more clearly defined, it is even more apparent that its further development under the impact of fresh drives depends not only on the nature of those drives or the nature of external circumstances, but also on its own nature, its own susceptibilities for development. That is, its development under such impact consists of special differentiations of general style tendencies.

The last major factor considered in cognitive development and style characterization concerns the control and regulative function of styles. As such, the major consideration is that of 'ego functions' which are considered to be analogous to the initial organizing configuration in so far as that structure can be regarded as an initial tension-maintaining or control structure not only in its threshold aspects, but also in its organizing aspects. Generally speaking, control may exist in the form of a specific counterforce or restraining structure or it may be an aspect of an organization of energy that accomplishes other results as well. Indeed, restraint and transformation of energy are, in fact, necessarily linked; no restraint of continuously supplied energy is possible without transformation, and no transformation is possible without a component of restraint. The infant comes equipped for certain modes of experiencing and discharging, that is, organizing tension however primitive these may

as yet be. For instance, he comes equipped to suck, with a psychological 'readiness' for sucking, and a 'readiness' to respond to the nipple. If this innate 'readiness' is well established and if it is completely coordinated with certain physical capacities and apparatuses, then what would otherwise be discharged in sucking, and what would otherwise be experienced as a less differentiated tension is experienced in a more differentiated and directed form. To the extent that this occurs, one may speak of this 'readiness', that is, the total psychological equipment that allows for a more differentiated mode of experience and discharge, as a tension organizing and tension maintaining structure. One may imagine, in other words, that the infant who is better equipped in this way has a relatively higher threshold for tension discharge in diffuse activity and is able to 'tolerate' more.

Thus to summarize, when psychological organizing equipment is advanced and modes of functioning further developed and differentiated, the individual condition is advanced from one of relative helplessness vis-a-vis drive tensions to one of greater intentionality, and relatively diffuse tension is converted into intentional, directed activity and expectation. One aspect of this process may be described as the development of a tension maintaining capacity of capacity to restrain, postpone, or control discharge. This increased capacity for control or restraint of tension discharge occurs not because of any infantile will power, but because the form of tension has been changed; the existence of anticipations, expectations, and directedness has, so to speak, revised the meaning of control or restraint. To the extent that tension is undifferentiated (lacking in subjective organization, aim, or direction) it seems to be essentially unrestrainable and, to that extent, immediate discharge in one form or another takes place. On the other hand, to the extent that tension

has been converted to or exists in the form of intention, anticipation, and directed activity, it does not require further restraint, but will within certain limits, automatically be maintained. From this point of view, increased organization of tension, increased intentionality, and increased capacity for tension-discharge-delay are all aspects of the same process.

### Style and Defense

In conjunction with the development of this 'tension maintaining capacity' or capacity to restrain, postpone, or control discharge is the simultaneous development of characteristic modes of defensive operations which are a functional part of the particular 'styles'. As such, this relationship between style and defense is of particular importance to the present investigation; if defensive processes are operative, they should become manifest in the learning and retention of various types of stimulus materials.

Shapiro points out that the relationship between style and defense can be described as being very interdependent; the individual's style of functioning (e.g., thinking) characterizes defensive operations as well as all others and determines their particular shape. The logic for such an assertion is readily obvious. If, as Shapiro assumes, defenses may be regarded as tension controlling or regulative structures, then styles may likewise be regarded as reflecting regulative structures. Thus, when an affect, drive tension, or derivative, accompanied by excessive discomfort or anxiety, is or threatens to be experienced consciously, that experience is of such a sort as to move the individual, according to his style, to some tension reducing function. He is moved to some feeling, thought, and often action, one result (although not the only one) being the elimination from

consciousness of the incipient experience and its attendant discomfort. Viewed as such, there are two general features of the defensive process that are readily apparent. First, the process is one in which the conscious individual actively participates, not by choice, but simply by being what he is. This is in contrast to the often popular 'marionette' viewpoint that regards the individual as passively protected by defenses from threatening or discomforting tensions. Second, since the process is one in which the particular and characteristic experience of a special tension automatically triggers some characteristic tension reducing function, it is a process by which a psychological state is self stabilizing and self-maintaining. Such a view can be seen as following those, particularly Menninger (1963), who have argued for a homeostatic understanding of defensive processes.

In this framework, therefore, the defensive process may be regarded as a special case of the operation of the general style of functioning, namely the operation of that style under special conditions of tension. Insofar as any style represents a tension organizing system it may be said to have self-maintaining aspects, that is, the capacity to organize unusual tensions in familiar ways; under conditions of special tension, these self-maintaining aspects become especially visible. It is possible to describe these unusual tensions in terms of their counterparts in normal experience, but, to the neurotic person, they are not equivalent to normal experience. In each case, a state of tension is created that can only be experienced according to the modes of function in existence and can only move the individual in some direction that will diminish it. Of course, such a process does not eliminate the underlying sources of the particular tension but only prevents conscious development of it.

Shapiro presents three corollaries that follow from, and more

fully outline this view of defense. A consideration of these corollaries is necessary if a more comprehensible grasp of defensive functioning is to be attained:

1) The defensive process cannot be regarded merely as an operation of specific drive-inhibiting mechanisms since it involves the whole drive tension and stimulus organizing style. On the contrary, if this viewpoint is correct, the commonly listed defense mechanisms should be susceptible to analysis in terms of the thought and attention processes, affect modes, and the like, that are involved in them; analysis, in other words, as aspects or features of more general modes of functioning.

2) Any defensive process, insofar as it is an aspect of the organization of tension according to certain forms, excludes from consciousness not merely specific mental contents, but classes of mental content, and subjective experience. It may be noted that this fact has a certain implication for psychotherapy; the defensive process may be confronted therapeutically over a very great range of psychological content, including the apparently 'superficial'.

3) The defensive process is not, strictly speaking, an entirely intrapsychic process. Since it involves the whole style of functioning, it involves at several points, the individual's relationship to external reality. Thus, the neurotic person's mode of activity, including his characteristic mode of communication as well as his mode of apprehension of the external world, are all likely at various times, to be essential elements of defensive functioning. Such a self-reinforcing relationship between defense, style and cognition can be seen as operative in all of the neurotic styles. It is only in a rather thorough analysis of the particular styles that the consistency in functioning becomes manifest.

Shapiro's 'Neurotic Styles'

Obsessive-compulsive style. Shapiro points out that the obsessive-compulsive style of functioning is characterized by three predominant traits: (1) rigidity, (2) loss of reality, and (3) distortion of experiences of autonomy. All of these, to varying degrees, illustrate certain dysfunctions in cognitive functioning and all describe a particular style of thinking and behavior.

Rigidity is used to describe a characteristic mode of attention where the obsessive-compulsive individual actively inattends to new facts or a different point of view. This is not to say that the attention is vague; on the contrary, it is quite intense and shows a characteristic sharp focus. The obsessive-compulsive concentrates; in fact he seems always to be concentrating and focusing on minute detail. Because of this, the obsessive-compulsive is unable to comprehend those aspects of the world that require a more passive and impressionistic sort of cognitive experience; that which is peripheral or incidental to its original, intended focus of attention, or that may not even possess a clear intention or sharp focus in the first place. For this reason the obsessive-compulsive characteristically does not perceive the 'tone' or 'affect' of special social situations.

Distortion of experiences of autonomy generally refers to motivational aspects of the obsessive-compulsive's behavior. Shapiro points out that, for the obsessive-compulsive, self direction is distorted from its normal meaning of volitional choice and deliberate, purposeful action to a self-conscious directing of every action, to the exercise, as if by an overseer, of a continuous willful pressure and direction on himself and even, an effort to direct his own wants and emotions at will. The obsessive-compulsive not only tolerates no interference with his own

willfull direction by others, but also, embarked on his deliberate course, will tolerate no interference even from himself. Because of this he would appear to lack a spontaneity of behavior which would supposedly hinder any attempt to alternate learning strategies in an experimental situation.

Loss of reality refers generally to the obsessive-compulsive's characteristic preoccupation with minute technical detail and his loss of the ability to view the world in a general way. As such, it can be viewed as being another aspect or even a result of his intellectual and cognitive rigidity. Because of the obsessive-compulsive's narrow interest in technical signs and indicators which prevent him from seeing things in their real proportions and recognizing the real substance of the world, there exists the danger that as his perceptions and his pathology become more engrained, the minute detail of his perceptual experiences will in fact, become the only substance of which he is aware and he will function solely according to this subjective reality. Thus, what may be for the normal person an insignificant detail in relation to the whole, will be, for the obsessive-compulsive, sufficient reason to radically change his perception of the whole.

Paranoid style. Shapiro points out that the paranoid style is intrinsically more severely pathological than the other three styles considered. It is the only one that, in its more pervasive and extreme forms, involves a psychotic loss of reality. Characteristically, paranoid modes of functioning, ways of thinking, types of affective experience, and the like (even such specific mental operations as projection) appear in many degrees of severity and, also, are modulated in a great many ways by other factors and tendencies. Aside from the dimension of severity, there are, descriptively and quite generally speaking, two 'types' of people who fall within the category of this style: furtive, constricted,

apprehensively suspicious individuals, and rigidly arrogant, more aggressively suspicious, megalomaniac persons. Of course, since these are only two differentiations of a more general style, they are by no means sharply distinguishable. One can find representatives of a range of severity from frankly delusional states to, perhaps, moderately severe character distortions in both categories. Both because of this and the fact that in the present study the subjects investigated were members of a typically 'normal' population, the use of the term 'paranoid style' was limited to those paranoid conditions sometimes described as 'paranoid characters'. These are essentially non-pathological individuals in whom such paranoid traits as suspiciousness are both pervasive and longstanding.

Cognitively, the paranoid character is characterized by a suspicious mode of thinking which is impressively rigid; rigid to the extent that the paranoid individual looks at the world with a fixed and preoccupying expectation, and searches repetitively for confirmation of it. He does not pay attention to apparent facts, but instead, pays sharp attention to any aspect or feature of them or their presentation that lends confirmation to his original suspicious idea. In this way it can be said that the paranoid does not ignore data; on the contrary, he examines it quite carefully and what is not relevant to his supposition is dismissed or disregarded. The suspicious person's attention is thus a heavily biased one; and as such, can be viewed as extremely rigid and unalterable. It follows that since the paranoid can extract what he wants from the stimulus patterns surrounding him, he thus can impose his own erroneous conclusions virtually anywhere. Thus, the paranoid person can be at the same time absolutely right in his perception and absolutely wrong in his judgement.

Hysterical style. The hysterical style of cognition, quite

generally, is characterized by the fact that it is impressionistic; it is global, relatively diffuse, and lacking in sharpness, particularly in sharp detail. The hysterical individual, therefore, tends cognitively to respond quickly and is highly susceptible to what is immediately impressive, striking or merely obvious. Shapiro outlines three general traits which to him are crucial aspects of the hysterical mode of cognition.

The first trait considered is the hysterical incapacity for persistent or intense intellectual concentration. It is pointed out that the hysteric typically arrives at solutions to problems by what one calls 'hunches'. Shapiro emphasizes that for hysterical people the hunch or the impression is the final conscious cognitive product. Thus, it is often observed that hysterical people are relatively lacking in intellectual curiosity and in general, that this style of cognition is not consistent with sustained intellectual curiosity.

The second manifestation of the hysterical style of cognition is impressionability. As pointed out earlier, impressionistic cognition ordinarily stops at the obvious or at that which is immediately and easily seen, and is not compatible with curiosity. The same impressionistic character of this style of cognition that makes for satisfaction with the obvious or immediately apparent, also makes for great susceptibility to that which is vivid, striking or forcefully presented. Hysterical attention, in other words, is easily captured. As such it is easily interrupted by transient influences and suffers from a general distractibility.

The third trait concerning the hysterical mode of cognition refers to the nonfactual world in which the hysterical person lives. To put it most simply, hysterical people are often remarkably deficient in knowledge, in particular, factual knowledge. Shapiro points out that:

This lack of factual detail and sharp definition can hardly be attributable to the operation of the defense mechanism of repression. It is not a matter of the exclusion of specific ideational or emotional contents from consciousness and does not principally have to do with the contents of thought at all. It is a form of cognition, although, to be sure, it is a form that is often likely to result in vagueness or diffuseness - even barrenness - of clear, sharp thought content. (p.113)

Thus, the cognitive experience of the hysteric is an experience not of sharply observed facts and developed judgements, but of quick hunches and impressions. As a result, it would appear that these people are characterized by a hasty and insufficient organization, refinement, and integration of mental content. To be sure, this striking inhibition of cognition (the not 'seeing' of things that may be obvious to others) is understandable in the light of this cognitive style. Not seeing a highly and uncomfortably charged fact or, more accurately, not bringing into clear, sharp focus of attention that which may be dimly or peripherally experienced as uncomfortable is facilitated by the general absence of sharp focus or attention. Thus, one often notices in an hysterical individual, hints or suggestions of an unpleasant fact or possibility woven so conspicuously through the background of what he is saying that one finds it difficult to believe that the individual himself is unaware of it. But, in actual fact, he very often is, and it is exactly that failure to bring such a thought content, which is, as it were, on the periphery of attention, into sharp focus of attention that is facilitated by this style.

Impulsive style. Shapiro points out that the distinctive quality of the 'impulsive' subjective experience revolves around an impairment of normal feelings of deliberateness and intention. It is manifested in the nature of the experience, for these people, of 'impulse' or 'irresistible impulse' and in the significance of 'whim' in their mental lives.

Typically it is an experience of having executed a significant action, not a trivial one, without a clear and complete sense of motivation, decision, or sustained wish. It is an experience of action, in other words, that does not feel completely deliberate or fully intended and in most respects seems to approximate the normal experience of 'whim'. As such, impulsive action is behavior that is unplanned.

It must be emphasized that lack of planning is only one feature of the impulsive style; there are others. Observation reveals that capacity for abstraction and generalization, and reflectiveness in general are all impaired. The fact is that the cognition of impulsive people is characterized by an insufficiency of active integrative processes that is comparable to the insufficiency of integrative processes on the affective side. Thus it can be viewed that the actual impairment lies at the level of cognitive functioning and thinking; there is an inability to successfully integrate perceptual data. Shapiro points out that in an analysis of the normal process of 'judgement' it becomes readily apparent that in the impulsive person mechanisms of judgement are either impaired or absent. Typically it is not pertinent information that is lacking or unavailable to the impulsive but rather the active, searching attention and organizing process that normally puts such information to use. If certain factors move the impulsive to quick action, the nature of his judgement or, more accurately, his substitute for judgement facilitates such action, allows it to 'look good' to him, and allows him to remain oblivious to the drawbacks or complications that would give another person pause and might otherwise give him pause as well. For this reason planning, concentration, logical objectivity, and reflectiveness in general are all impaired in impulsive people; each of these requires a kind of cognition for which the impulsive character is not equipped. Planning, like judge-

ment, involves shifting attention among various possibilities and directing attention not merely to what is striking or impressive now, but also to what might be important in the future. In general, cognition that is concrete is inevitably dominated by the present, and, in such cognition, the significance of the distant future shrinks. Concentration implies sharply focused, sustained attention and intense examination; it is impaired whenever the characteristic mode of cognition is passively responsive to and, therefore, distracted by the next striking thing that comes along. Reflectiveness, in general, implies turning over a situation in one's mind, again an active shifting of attention now to this aspect and now to that. Similarly, objectivity (or what is sometimes called the capacity to 'take distance') requires attention that is directed not only to what is immediately interesting, striking, or relevant to the concerns of the observer, but also to what is significant in a more general or more permanent sense. In all of these, awareness is dominated by the immediately striking and personally relevant, that is, by that which is relevant to the need or impulse of the moment. The impulsive person does not search further, he does not 'take distance', and his awareness of long-range or logically important considerations is limited. Such a mode of cognition cannot stabilize against speedy action on a whim or impulse; on the contrary, it serves the immediate whim or impulse. This is so because from the viewpoint that such cognition provides, the world can only be seen as discontinuous and inconstant; a series of opportunities, temptations, frustrations, sensuous experiences, and fragmented impressions.

#### Style and Cognition

Shapiro emphasizes that to the extent an individual is characterized by any one specific style, that individual is 'active' within that neurosis

and actively participates in his neurosis and functions according to it, in a way that sustains its characteristic experiences. What the neurotic does and the special way in which he does it, his conscious attitudes and the way he sees things, are essential functional parts of the neurosis. He seems to think in such a way and his attitudes and interests are such as to continue and sustain the neurotic process and to make the characteristic neurotic experiences inevitable, however discomforting they may be. Thus, in general, the neurotic's attitudes and interests will be of a sort that guarantees that the next neurotic act (which from an objective standpoint may sustain and continue the neurotic process) will appear as the only plausible next thing to do. This is not to say, certainly, that he does this by choice or that he can be talked out of it. It simply says that his 'make-up' and the way he sees things (about which he has no choice) move him to feel, think, and do things that continue the neurotic experience and are indispensable to it.

Because of this; the fact that the neurotic person is not merely a victim of historical events but rather his way of thinking and his attitudes (cf. 'style') having also been formed by that history, are now integral parts of that neurotic functioning and move him to think, feel, and act in ways that are indispensable to it, emphasizes the importance for the psychologist of arriving in some way at a means of investigating the neurotic's 'cognitive style' which determines his functioning. Shapiro, in fact, points out the importance of such investigation:

Careful study of the styles themselves and a clearer, more detailed picture of the forms of cognition, activity, emotional experience, and so on, that characterize various pathological conditions is, I am convinced, an indispensable prerequisite to an understanding of origins. (p.15)

Of importance to the present study is this postulation of an underlying cognitive structure which determines the functioning of all

individuals. If as Shapiro assumes, the type of neurosis one develops is a function of the cognitive structure or 'style' of that individual in 'normal' life (before the development of the neurosis) then it is possible to see that all individuals, whether pathological or not, are characterized by specific modes of functioning. As such, each style can be viewed as a range including both the normal and clinical populations. The differences within 'styles' therefore would be differences in degree and an intensive investigation of the 'styles' found in a 'normal' population should yield qualitatively similar results to an investigation involving a 'neurotic' population. The only differences should be of a quantitative nature; typically the neurotic population would show a greater degree of differences between 'styles' than the 'normal' population.

#### Learning as an Indicator of Cognitive Functioning.

In his discussion of the 'hysterical style' Shapiro points out the value of learning techniques in the analysis of neurotic 'cognitive functioning'. Because of the existence of perceptual and attentional preferences in each of the neurotic styles, Shapiro posits that the qualities of memory and the conditions of forgetting should be closely related to the mode of prior learning and attention and thus to the specific styles. Therefore what he is suggesting is a twofold relationship between recollection and original cognition. The first aspect of this relationship consists simply in the fact that original cognition, including the organization of the cognitive data at the time, provides the material on which the recollection must draw. He emphasizes that recollection certainly need not and hardly can be identical in its content with the original cognition, but, on the other hand, it certainly must be limited by it. The second aspect of the relationship posits that

the process of recollection-- the organizing and assembling of memories and the concentration of attention to them-- is directly related to the style of the original cognitive process. Thus in both learning and memory, the 'cognitive style' is having a dramatic effect.

A very similar point of view regarding cognitive functioning has been put forward by Neisser (1967). An analysis of his system provides much support for Shapiro's interpretation of cognitive dysfunctioning as the underlying causal mechanism involved in neurotic disorders.

Neisser (1967) emphasizes as a basic tenet of his approach that the world of experiences is produced by the man who experiences it. Whatever we know about reality has been mediated, not only by the organs of sense but by complex systems which interpret and reinterpret sensory information. As such, both perception and memory are constructive acts, organized in ways that correspond to the structure of these acts. Thus, in such a system, the 'memory traces' are not dormant copies of earlier experiences, somehow aroused into consciousness from time to time. Stored information is never aroused, it is only used, just as stimulus information is used in the act of perception. One does not see objects simply because they are there, but after an elaborate process of construction (which usually is designed to make use of relevant stimulus information). Similarly, one does not recall objects or responses simply because traces of them exist in the mind, but after an elaborate process of reconstruction (which usually makes use of relevant stored information).

Other facts also tend to mediate between the object and its central processing. Neisser points out that when we first perceive or imagine something, the process of construction is not limited to the object itself. We generally build, or rebuild, a spatial, temporal, and conceptual framework as well. These frames of reference can be thought of as a higher

level of cognitive construction. At the lower levels of analysis the pre-attentive processes (attention and guided movement) function to delineate units, provide partial cues, and control simple responses; at the next higher level focal attention builds completely structured objects or movements, one at a time, on the basis thus provided; and on a higher level still, the background processes build and maintain schemata to which these objects are referred. Thus, as is outlined, the functioning of our cognitive schemata or structures involves a very active building and re-building of sensory data. Because of this, the occurrence of individual differences becomes a rule, and thus, the occurrence of particular 'styles' highly probable.

Neisser points out that cognitive structures play a particularly significant role in learning and remembering. It is easy to see why the schemata control the fate of any stored information; they are themselves information of a similar sort. Because cognition is constructive and the process of construction leaves traces behind, the schemata themselves can be viewed as such constructions, elaborated at every moment in the course of attentive activity. Recall is organized in terms of these structures because the original experiences were elaborated in the same terms. It seems logical, and is the basic underlying rationale of this paper, that if cognitive structures can facilitate recall, we should be able to work backwards from observations of recall to learn something about them.

This aim, in particular, has been extensively pursued in recent studies of clustering and word-association. In a method described by Bousfield (1953), for example, subjects were asked to memorize a list in which all of the words belonged to certain categories, but are presented in a randomized sequence. The order of recall is left to the subject's own discretion, and thus can reveal a good deal about the 'subjective

organization' of the information involved. The typical subject recalls first a cluster of words from one category, then some from a second group, and so on. Other research (e.g., Tulving, 1962) shows that this effect occurs even when the material has not been specifically designed to encourage categorization.

It must be emphasized that while cognitive structures make recall possible, they also have some negative effects. By necessity they tend to introduce bias and distortion into both the initial construction and the later reconstruction. Documentation of these changes make up the bulk of Bartlett's (1932) Remembering. They also have been studied in more conventional experimental situations (e.g., Postman, 1954; Waly & Cook, 1966), however, these results have failed to be replicated.

Because of the nature and functioning of the cognitive structures, Neisser, like Bartlett (1932) was faced with the problem of explaining how the cognitive schemata selects and uses the stored information. Since the schemata by definition cannot do this selecting, and relying on experimental evidence (Yntema & Trask, 1963), he (Neisser) postulated a higher level data processing mechanism which can intervene as a retrieval agent. The importance of this postulation in relation to Shapiro's conception of 'style' is quite striking. If we assume that human memory stores information about processes rather than contents, mental activities can therefore be learned, and may in fact be the only things that are ever learned. With the executive mechanism directly bearing on all primary and secondary processing at the lower levels, it becomes obvious that characteristic modes of perceiving, learning, and remembering would appear to be the rule in human functioning.

Evidence from other areas (e.g., personality) has also led investigators to conclude that people show characteristic, self-consistent

ways of functioning in their perceptual and intellectual activities. As early as the late 1940's major approaches and theories had been developed to account for regularities in human functioning. First introduced by Klein in 1949 the term 'cognitive control principles' was conceived of as a type of ego structure which is an essential attribute of personality organization and which controls certain aspects of adaptive behavior. These 'principles' were presumed to emerge in the course of development as mediating structures that take their form from drives, from constitutional characteristics of the relevant ego apparatuses, and from the adaptive problems the individual had encountered.

Gardner, (1960) summarized the research on the five major control principles which had until that time predominated; leveling-sharpening, equivalence range, scanning, constricted-flexible control, and field-articulation. He pointed out that all of the studies indicated that each of the controls is evident in a variety of situations which are linked by generically similar adaptive conditions and requirements. It was emphasized that although these principles of reality contact are, in adults, relatively stable and enduring aspects of cognition, they are, however, capable of notable temporary variations under the impact of intense need, anxiety, preoccupation, etc.

In the same year, Gardner, Jackson and Messick (1960) attempted to explore the relationships between the cognitive control principles and intellectual abilities. Their results showed the clear multi-dimensional nature of cognition at the level of organization represented by control principle constructs. In correlational and factor-analytic terms, the measures used to represent different controls appeared remarkably independent of each other. The major theoretical contribution of the study derived from the clear evidence that intellectual abilities and

cognitive controls are not isolated aspects of cognitive organization but are mutually interrelated. The arbitrary distinction that had sometimes been maintained between intelligence and the broad-scale organization of cognition was thus deemed as inappropriate. However, it is emphasized that not all cognitive controls are necessarily related to intellectual abilities.

Kagan, Moss and Sigel (1961) in their investigation of 'conceptualization' point out evidence for the existence of "cognitive style, a term that refers to stable individual preferences in mode of perceptual organization and conceptual categorization of the external environment." Their results showed that there exists a strong association between the way adults sorted human figures and varied aspects of their behavior, be it association to words, organization of words for commitment to memory, interpretation of ink blots or pictures, or speed with which a subject lifts his hand from a telegraph key. In a later paper (Kagan et al, 1964) these same authors attempted to correlate conceptual style with relevant personality variables. Their results suggested that for men at least, different conceptual styles are associated with an introspective attitude and the non-repression of conflictful ideas.

More recently Davis (1969) both methodologically and developmentally investigated the concept of 'cognitive style' or as he states, "the way in which an individual perceives, categorizes and labels reality". His results emphasize the possible misconception of viewing an individual's cognitive style as a unitary process, or a single preference, and suggest the value of considering the pattern of cognitive styles in research. He points out the need to reconsider the nature of these styles.

Thus, it appears that there is much evidence from various areas

which would tend to support Shapiro's conceptualization of 'cognitive styles'. Because of the crucial role that learning plays in cognition, it would seem both logical and of value to investigate the functioning of these different styles, if in fact they do exist, by giving a standard verbal learning task to various categories of individuals who are characterized by specific 'styles' of functioning. In this way would it be possible to work backwards from the observed performances on a learning and retention task to arrive at some conceptualization regarding the functioning of the cognitive structures of different 'types' of individuals.

### Hypotheses

It was hypothesized that because of the differences in learning materials that were presented and the learning strategies that were employed over both an immediate and delayed retention period, there would be observed a characteristic differential responding between subject groups on both the learning and retention task. The differential responding, it was assumed, would be a result of the functioning of the different 'styles' of the subject groups, since each were characterized by specific perceptual and learning modes. Any attempt to predict the direction of the findings was avoided; since the study was essentially exploratory, the adoption of the null hypothesis seemed of most value.

## Method

### Subjects

Because of difficulties that arose concerning the availability of a 'neurotic population' of the size and structure demanded by the present study the experimenter (E) chose to adopt a more practical strategy of subject selection and employ only subjects (S) from a 'normal' population. Because of the apparent correlative significance between personality attributes and many aspects of cognition, it was decided that a categorization of S's according to specific 'styles' or cognitive functioning could be obtained through the employment of a personality inventory that was sensitive to the different 'styles' of cognitive functioning. For this reason, the Personality Research Form (PRF) (Jackson, 1967) was selected as a pre-experimental screening device. In this way it was possible to identify individuals who demonstrated specific patterns of trait clusterings that were assumed to be representative of the 'styles' that Shapiro had described.

Thus, of four hundred and fifty (450) students who were administered the PRF, ninety-six (96) were chosen to participate in the experiment. These 96 S's were chosen to be a member of one of three groups:

- 1) Group E<sub>1</sub>, consisted of 32 Ss who showed the highest scores (scored greater than 1 standard deviation above the mean) on certain prescribed PRF subscales. It was assumed that a high score indicated the 'existence' of certain specific 'styles' among the members of this group.

- 2) Group E<sub>2</sub>, consisted of 32 S's who showed the lowest scores (scored greater than 1 standard deviation below the mean) on the prescribed PRF subscales. It was assumed for the purposes of this experiment that a low score indicated one of two things: either there was an absence of any of the particular 'styles' that were being investigated, or there was the 'presence' of a 'style' that was operationally in juxtaposition to the

'styles' under investigation. Results from group  $E_2$  were compared with the results from the other groups in an attempt to arrive at some understanding of what generally was operative in their learning and to what 'styles' they most closely resembled.

3) Group C, was the control group and consisted of those  $S$ 's whose scores on the prescribed PRF subscales fell about the mean (were within 1 standard deviation above and 1 standard deviation below the mean). It was assumed that this group showed neither a preponderance nor 'lack of' any one of the particular 'styles'.

Because there was within each group an analysis of  $S$ 's according to their rating on the four (4) basic 'styles' that were under investigation (obsessive-compulsive, hysteric, paranoid, and impulsive) there was therefore within each group of 32  $S$ 's, 8  $S$ 's representing each 'style'. This allowed for comparisons of cognitive functioning not only between, but also within the three groups. The composition of the subject population is illustrated in Figure 1.

|                 | OBSESSIVE-COMPULSIVE<br>N=24 | HYSTERIC<br>N=24     | PARANOID<br>N=24     | IMPULSIVE<br>N=24    |
|-----------------|------------------------------|----------------------|----------------------|----------------------|
| High<br>N=32    | 8 hi<br>OC                   | 8 hi<br>Hyst         | 8 hi<br>Par          | 8 hi<br>Imp          |
|                 | 4 males<br>4 females         | 4 males<br>4 females | 4 males<br>4 females | 4 males<br>4 females |
| Average<br>N=32 | 8 avg.<br>OC                 | 8 avg.<br>Hyst       | 8 avg.<br>Par        | 8 avg.<br>Imp.       |
|                 | 4 males<br>4 females         | 4 males<br>4 females | 4 males<br>4 females | 4 males<br>4 females |
| Low<br>N=32     | 8 lo<br>OC                   | 8 lo<br>Hyst         | 8 lo<br>Par          | 8 lo<br>Imp          |
|                 | 4 males<br>4 females         | 4 males<br>4 females | 4 males<br>4 females | 4 males<br>4 females |

Figure 1 Design of Subject Composition.

Only those S's were chosen who had never participated in an experiment of this type; thus, all S's were assumed to be naive as to the purpose of this experiment. The S's were drawn from both the summer school and regular student populations at the University of Manitoba. Their mean age was 20 with a range from 18-21. To insure that all S's possessed approximately the same language habits, only those who spoke English natively were allowed to participate. Because the design of the experiment was a within S design, subsets of 16 S's in each of the E and C groups received a counter balanced presentation ordering of the experimental task. In all groups there was an attempt made to control for both age and sex influences through a counterbalancing among subject cells.

#### Apparatus and Material

Measuring Instrument. Because of the need to administer a screening device that was sensitive to the differences between the four 'styles' investigated so that individuals could be accurately evaluated and categorized according to cognitive functioning, it was decided to employ the PRF. Not only is the PRF primarily focused upon areas of normal functioning, rather than upon psychopathology (it was designed for use among college students) but it also gives measures on many traits which, at least descriptively, appear very representative of the particular 'styles' that Shapiro describes. The value of employing such an instrument was readily apparent; even though it might not have allowed a categorization of individuals that was exactly identical to that of Shapiro, it still allowed for a categorization into specific 'styles' or modes of cognitive functioning. As such, different 'cognitively functioning' groups were still able to be identified.

Certain subscales of the PRF seemed to describe very closely the 'styles' that Shapiro identifies in his Neurotic Styles. From both the 'description of a high scorer' and the 'defining trait adjectives' that Jackson provides for each of the PRF subscales (descriptions of all the subscales are given in appendix 1) similarities between the descriptions given by Shapiro and the selected PRF subscales were readily apparent. In conjunction with this, correlational data provided by the inter-correlation matrix of the PRF normative sample (Jackson, p.31) enabled those subscales which 'hang together' and as such more completely describe a 'style' to be identified and evaluated. Adopting as a criterion a correlation of .50 (therefore accounting for 25 per cent of the variance), the following scales were employed in an attempt to ferret out the different 'styles':

- 1) Obsessive-compulsive. The cognitive structure and order scales were used as measures of the obsessive-compulsive 'style'.
- 2) Impulsive. The impulsivity scale was used as representative of a measure of the impulsive 'style'.
- 3) Hysteric. The change scale was used as a measure of the 'hysterical style' of functioning.
- 4) Paranoid. The defence and aggression scales were used as a measure of the paranoid 'style'.

Jackson (1967) points out that factor analytic results have suggested a convenient basis for organizing the characteristics measured by the scales into a number of superordinate categories. From these results it can be seen that all of the scales used in the present study either are classified as measures of impulse expression and control or measures of degree and quality of interpersonal orientation. An outline of these groupings is given in Appendix 2. From this, and especially from

the fact that three of the four 'styles' are represented by scales in the 'measures of impulse expression and control' grouping, the existence of cognitive control structures within the scales investigated was suggested.

### Experimental Task

The experimental task employed in the present study was designed specifically in an attempt to arrive at some understanding of the different cognitive functioning that is involved in each of the four groups under study. As such, a verbal learning task was designed which allowed for a variable reaction on the part of the subjects on various levels of learning and retention. An attempt was made to employ techniques and materials that were sensitive to the differences in the cognitive functioning peculiar to each 'style'. For this reason, each level of learning materials, learning method, and retention period allowed for performance on at least two levels; in this way, individual differences in functioning were allowed to be expressed. Because the design of the experiment was a within-S design (every S experienced all conditions), it was hypothesized that individual S's, functioning according to their own peculiar cognitive principles or 'style' would be pre-disposed to perform in specific and characteristic ways to the different conditions and materials.

The verbal learning task employed consisted of two lists of picture and word paired-associates (PA). The pictures and words differed on the concreteness-abstractness dimension, and the subject was limited to two specific learning strategies, either imagery (I) or repetition (R).

The concrete-abstract dimension. Concreteness (C) has been found to correlate with performance in experiments on free recall (Dukes & Bastian, 1966; Olver, 1965; Stoke, 1929; Paivio, 1967) recognition

memory (Gorman, 1961; Jampolsky, 1950; Olver, 1965), short term memory (Borkowski & Eisner, 1968), paired-associate learning (Epstein, Rock, & Zuckermann, 1960; Paivio, 1965; Winnick & Kressel, 1965), associative speed (Paivio, 1966; Smith & Harleston, 1966; Yuille & Paivio, 1968), perceptual selectivity and recognition speech (Borkowski, Spreen, & Stutz, 1965; Riegel & Riegel, 1961; Spreen, Borkowski & Benton, 1968), and physiological indices of arousal (Paivio & Simpson, 1966; Simpson & Paivio, 1966; Smith & Harleston, 1966). In an attempt to arrive at an adequate understanding of these findings, Paivio, as early as 1963 had hypothesized that stimulus-term-concreteness was facilitative to PA learning because of the superior capacity of concrete (as compared to abstract) stimulus norms to evoke sensory images which could function as S-R mediators (Spiker, 1960; Reese, 1965; Smith & Noble, 1965). One possible implication of this special effect of concreteness for the present study was that it implied a multistage coding process (cf. McGuire, 1961) in which stimulus and response terms are encoded into nonverbal images during their paired presentation. On the recall trials the stimulus term could presumably act as a cue for the compound image, which can be decoded to yield the appropriate verbal response. It seemed to this E that if a multistage coding process was in fact operative, differences in performance between the groups studied could be explained in terms of this cognitive dimension.

For this reason, in an attempt to ferret out any group differences in the ability to encode stimulus materials, the learning materials employed (picture and word paired associates) in the present study differed along the concreteness-abstractness dimension. Using as a guideline the concreteness, imagery, and meaningfulness values presented by Paivio, Yuille, and Madigan (1967) it was posited that by holding both the

imagery and meaningfulness values constant, while employing only those items which scored either high or low on the concreteness scale, any effect of word concreteness on learning and retention among the groups studied could be arrived at and evaluated. It was assumed that because the groups investigated differed on their focus of attention, (as a result of their different cognitive functioning) concrete items would be more easily learned by particular groups than abstract items, and vice versa. For example, the fact that obsessive-compulsives concentrate on minute, technical detail whereas the hysteric is characterized by a global functioning would seem to indicate that these groups would show preferences to specific types of stimuli, those which are either concrete or abstract.

The use of pictures and words. The employment of both pictures and words as materials to be learned was a further attempt to introduce variability into the experiment in order to observe differential functioning between the groups. Evidence from experimentation on 'normal' populations has shown a consistent superiority of retention for pictures as opposed to words, (Yarmey & Barker, 1971; Epstein, Rock and Zuckerman, 1960; Wimer & Lambert, 1959; Kaplan, Kaplan & Sampson, 1968). Even though the explanations for this finding have been quite varied, the majority of them are in terms of encoding and retrieval processes. For this reason, it seemed logical to offer the subjects two learning materials; if different styles that vary with regard to focus and breadth of attention are functioning, a differential responding to either pictures or words seemed most probable. The fact that the pictures and words employed varied on their concreteness and abstractness added greater importance to the dimension; it aided greatly in locating the functional attribute of the stimulus material which was peculiar to the specific 'styles'.

Learning by imagery and repetition. Once again, it was posited that because of the introduction of two learning techniques or strategies, variability would be introduced which would allow for a differential functioning by the specific groups. It is generally accepted that the major effective psychological attribute underlying linguistic abstractness-concreteness is imagery (Paivio, 1963, 1965). Because of their consistent association with specific objects and events, concrete nouns are assumed to be particularly effective stimuli for the arousal of sensory images, which are viewed in this context as conditioned sensations (cf. Mowrer, 1960). In support of this are the findings that concrete nouns exceed abstract nouns in imagery according to rating scale (Paivio, 1965), reaction time (Paivio, 1966) and physiological evidence (Paivio & Simpson, 1966; Simpson & Paivio, 1966). In addition, rated imagery scores of stimulus members have been found to correlate positively with PA learning even with intra-pair concreteness (C) and meaningfulness (M) controlled (Paivio et al, 1966). Because of the differences between the groups regarding rigidity of attention and learning, it was assumed that the use of either an imaginal mediation technique or mere rote repetition would have different functional effects on the performance of the particular 'styles'. In addition, any interaction within particular 'styles' between imagery and concreteness could be evaluated; any differences both between specific 'styles' and between the 'styles' and the normative data could be traced directly to differences in cognitive functioning.

In conjunction with this were the interpretations placed upon the consistent finding that imagery is superior to repetition as a learning strategy; investigators have offered as an explanation a multiple storage concept of memory (Paivio & Madigan, 1968). In particular Schnorr and Atkinson (1969), by manipulating both method of learning (imagery vs.

repetition) and recall condition (cued or non-cued) concluded that S's are able to employ two different encoding strategies concurrently during the presentation of a single list. Using as a model the Shiffrin-Atkinson (1965, 1968a) memory model, they posited that to be able to alternate learning strategies as such implies the functioning of different memory stores (see Schnorr & Atkinson, 1969). It seemed that to apply such an interpretation in terms of multiple encoding, storage, and retrieval to the results of the present study would be of great value. If there were differences between the groups in terms of attentional processes and flexibility of attention, these differences would result in differential encoding and storage among the specific 'styles'.

Performance in immediate and delayed retention. The employment of the immediate and delayed recall dimension was designed to be an important technique in arriving at conclusions regarding the degree of assimilation and integration that the learned materials had undergone both during the learning trial and between the first recall trial (immediate retention) and recall one week later (delayed retention). It was also an important technique in investigating what had appeared as functional in immediate learning as opposed to what was actually being learned and encoded. If, as Neisser (1967) hypothesizes, what is recalled is a function of the cognitive structures used to encode the stimulus material, it seemed imperative to study both immediate and delayed retention if an understanding of the functional cognitive structures was to be arrived at. Shapiro also recognizes this relationship. He points out:

The first aspect of this relationship consists simply in the fact that original cognition, including the organization of the cognitive data at the time, provides the material on which recollection must draw. Recollection certainly need not and hardly can be identical in its content with the original

cognition, but, on the other hand, it certainly must be limited by it. (p.110)

Thus by investigating the recalled material of the different groups, any differences observed could be attributed to differences in the cognitive structures and strategies employed.

The employment of two lists. The use of two lists again was an attempt to introduce variability into the experiment in order to see if there would be differential functioning. And yet, the employment of two lists has other important theoretical ramifications. Paivio and Yuille (1968) and Yuille and Paivio (1967) found that in multiple list learning trials the effects of instructions on how to learn the materials (either imagery or repetition) were somewhat transient, in that by the third trial (third list; each trial employs a different list) the rote repetition group was performing as well as the mediation groups. Their explanation of this effect was simply that S's do not in fact consistently follow instructional sets if the suggested strategies are inefficient for the type of material being learned. More recently Schnorr and Atkinson (1969) investigated this phenomenon in more depth. They also found evidence for a learning strategy shift within the 'repetition learning S's' as the test proceeded. In conjunction with this, their added finding that list 1, although being more poorly recalled in immediate retention, was better recalled than list 2 in delayed retention. These findings suggested to Schnorr and Atkinson that in fact what was happening was that there was a different storage process operative during list 1 study than during the study of subsequent lists.

The importance of employing two lists in the present study seemed readily obvious. If there is a strategy shift with a resultant change in the operative storage process, such changes are a function of the

individual's cognitive functioning. If, as hypothesized, the different groups under study do differ cognitively, this difference should be made manifest in their performance on both lists over immediate and delayed retention periods.

In order to arrive at the two lists that were used as the learning materials in the study, there was constructed two lists of 32 noun pairs each, which were selected from the Paivio, Yuille and Madigan (1967), concreteness, imagery, and meaningfulness values for 925 nouns. (The two lists employed are outlined in Appendix 3A and 3B). The criterion for selection was that for each word used the imagery value was greater than 5, the meaningfulness value was greater than 6, and the concreteness value was either greater than 6 for the concrete nouns or less than 4 for the abstract nouns. Since the mean values of I, C, and M in the original (Paivio) list were as follows, I=4.97, C=4.95, and M=5.81, then it can be seen that with the criterion set down as stated, not only were easily imagined nouns used so that the pairs could be studied by imagery without difficulty, but also only truly concrete and abstract items were employed.

In each list, one half of the 32 noun pairs were represented as simple line drawings. Thus, the actual lists employed in the experiment consisted of 16 noun pairs and 16 picture PA's each. Further, of the 16 noun pairs and 16 picture pairs in each list, one half (8) were concrete and one half abstract. Thus not only were one half of the pairs in each list either pictures or words but one half were also abstract or concrete.

The pairs were determined randomly, with the restriction that no pair involve items that were obvious associates and that there be only picture-picture and noun-noun PA's. Because the ordering of the picture and word PA's in each list was also realized to be an important variable,

the lists were structured so that the learning conditions, whether by Imagery or Repetition, changed after blocks of 4 PA's (2 noun and 2 picture PA's). A simple illustration of the structure of each list is given in Figure 2.

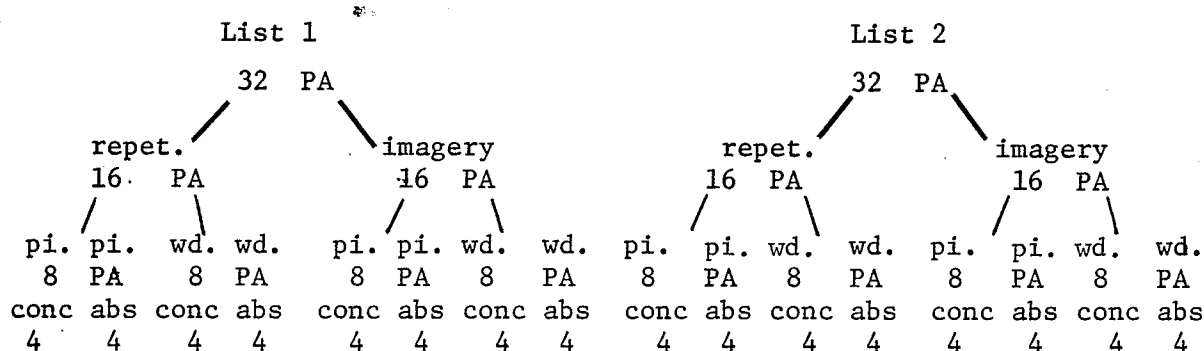


Fig. 2. Structure-Composition of List 1 and List 2.

Each PA item was presented on a white flash card. Thus for each pair presented, there were two cards held up side by side simultaneously by the E.

#### Procedure.

Of four hundred and fifty (450) students who were administered the PRF, ninety-six (96) were chosen to participate in the experiment on the basis of their scores on the selected PRF subscales.

All S's who participated in the experiment were tested individually. On entering the experimental room the S was seated, facing the E across a table. A list of instructions (see Appendix 4) was prepared for the S's explaining his task to him and each S followed along with his copy of the instructions while the E read them aloud. Any comments clarifying the S's understanding of his task were made when required; however, at no time was the purpose of the experiment revealed. Because all S's underwent the same experimental procedure it was possible to test the S without

having to know in what group he was a member. In this way an attempt was made to control for any E bias which might have resulted had the E known the group placement of the S's.

On the desk separating S and E were cards labelled "Imagery" (I) and "Repetition" (R). For each PA placed by the I marker (I items), S's task was to create a mental image in which the stimulus and response terms of the PA were interacting and to describe the image to E. For pairs placed by the R marker (R items), S was instructed to repeat the pair slowly four times, and to refrain from using either verbal or imaginal mediation. The importance of following these instructions and to use only the learning strategy indicated was emphasized. One half of the items in each list were studied by repetition, and the other half by imagery. An equal number of word and picture PA's were present in both the I and R conditions. Eight seconds was given for the study of each PA, and the study method (whether I or R) was alternated from one block of 4 PA's to the next. Subsets of 16 S's received a counter-balanced presentation ordering of the two lists, thus controlling for any error due to an order effect.

A recall test immediately followed the study of each list. There was a 3-minute break between the testing of List 1 and the presentation of List 2. After testing on both List 1 and List 2 S was requested to return one week later to participate in a "related experiment". Upon return, S was retested for retention of both lists.

## Results

Because of the complexity of the design (3 independent and 5 dependent measures) and the expectation of large memory differences, two sub analyses (immediate and delayed retention) were computed in conjunction with the overall analysis of variance. The analysis employed was chosen because of its ability to analyze multifactorial experiments where the factors are mixed (of independent and correlated levels). Therefore, in addition to the overall analysis which computed the interactions of all the factors, the data was divided according to memory (immediate or delayed) and an analysis was performed on each memory condition. As such, the data was compared across memory, as well as in interaction with the other variables considered. In conjunction with this was the further breakdown and analyses of the data according to level. Not only was the high x low interaction investigated but a separate analysis was also performed on each level. A listing of the raw data involved in the overall analysis is presented in Appendix 5, and the summary tables for each of the three analyses computed are presented in Appendix 6 (immediate memory), 7 (delayed retention), 8 (the overall analysis) and 9, (levels analysis). A listing of all the factors at each of their specified levels is presented in Table 1.

As can be seen from Table 1, the number of factors in the design precluded any simple analysis of the data. For this reason the data was further broken down and interpreted along the dependent-independent

TABLE 1

## Outline of Factors Involved in Analysis

| Independent Factors | No. of Levels | Description of Levels                                                      |
|---------------------|---------------|----------------------------------------------------------------------------|
| P.R.F. groups       | 4             | O-C, <sup>1</sup> Hyst. <sup>2</sup> Imp. <sup>3</sup> Paran. <sup>4</sup> |
| Level               | 3             | High, Average, Low                                                         |
| Sex                 | 2             | Male, Female                                                               |
| Dependent Factors   |               |                                                                            |
| Memory              | 2             | Immediate, Delayed                                                         |
| List                | 2             | List 1, List 2                                                             |
| Material            | 2             | Pictures, Words                                                            |
| Condition           | 2             | Imagery, Repetition                                                        |
| Type                | 2             | Abstract, Concrete                                                         |

<sup>1</sup>Obsessive-compulsive, <sup>2</sup>Hysteric, <sup>3</sup>Impulsive, <sup>4</sup>Paranoid.

dimension. It seemed that a more meaningful interpretation could be obtained by doing so, especially in light of the fact that the independent factors in particular bore the greatest clinical importance.

It was realized that by performing multiple analyses on the data there existed the problem of increasing the  $\alpha$  error in each of the analyses. In conjunction with this was the question of dividing the data by memory, since to do so would be to assume that immediate and delayed retention were independent. Since they are not, there arose the problem of how much of the variance in any of the interactions across memory could be accounted for in terms of the effect of memory. Because immediate and delayed retention are correlated, some of the effect of any interaction in delayed retention could be attributed to factors involved in immediate retention. As such there would be a confounding of influences across memory. Despite these problems however, it was considered justifiable to perform the analysis as outlined, considering the exploratory nature of the study.

Because the major focus of the study was in terms of the significant differences which were functional in the learning and retention characteristics identified for each of the four 'styles', an attempt was made to present the data in such a way that it would prove most meaningful in light of the clinical P.R.F. groups. As such an attempt was made to assemble and interpret the results mainly in terms of the clinically relevant factors.

#### Independent Factors

The data reveals that there were no significant differences between the P.R.F. groups with regard to 'level' or memory condition (see Figure 3). However, there was a trend observed in both immediate and delayed

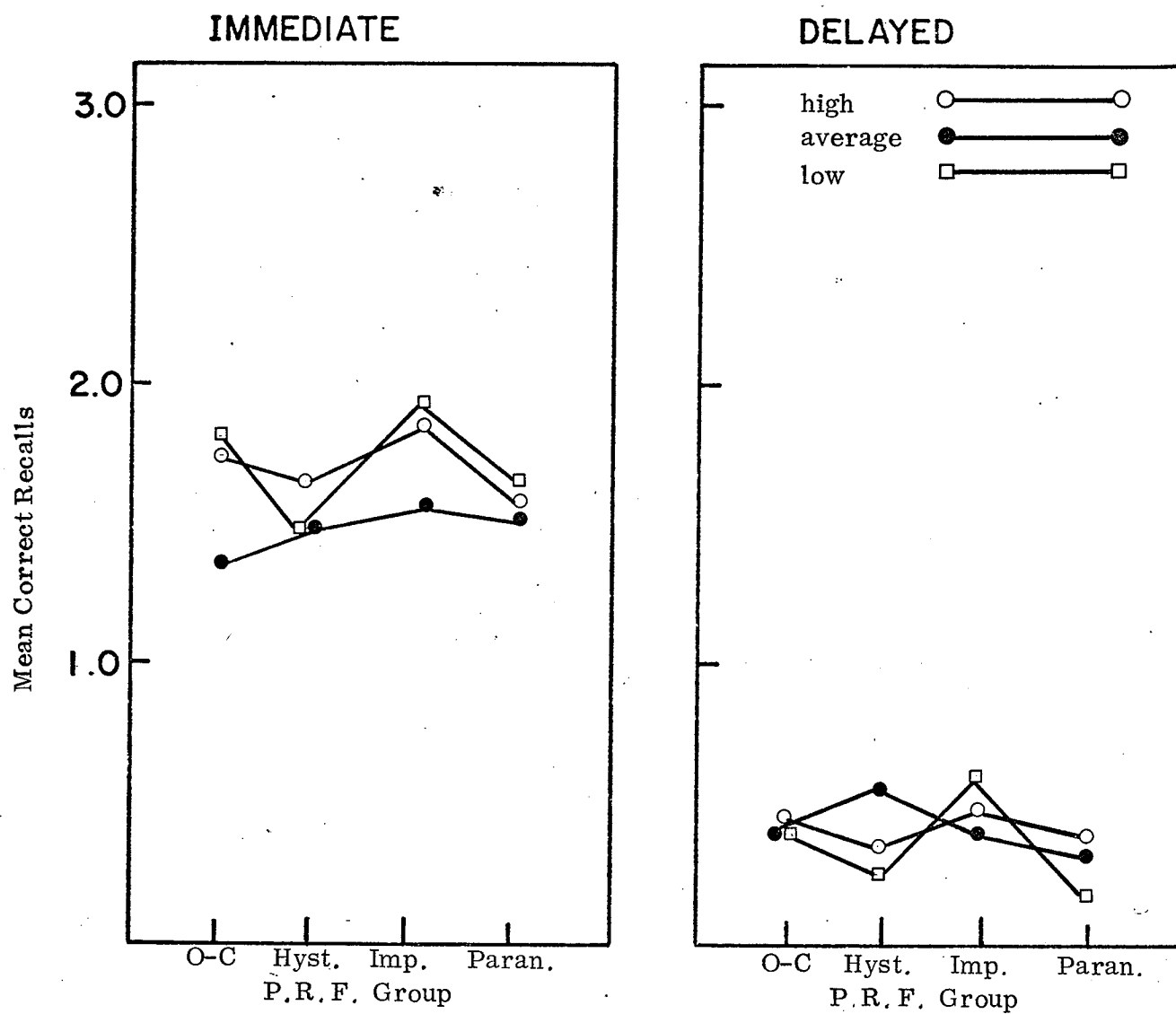


Figure 3. Mean number of correct recalls in immediate and delayed retention as a function of P.R.F. group and level.

retention for the high and low levels of the impulsive group to show a greater level of recall. This difference however was not statistically significant ( $F(2,72) = 2.66, p > .05$ ). A significant interaction was obtained between P.R.F. groups and sex ( $F(3,72) = 3.08, p < .05$ ), but this only occurred under the immediate retention condition and not under the delayed condition (see Figure 4). As can be seen, under immediate recall, females who were members of the O-C and Impulsive groups performed better than their male counterparts; whereas the males who were members of the Hysteric and Paranoid groups out-performed their female counterparts. This difference in recall performance was not observed under the delayed condition ( $F(3,72) = .554, F > .05$ ) where there was a trend for the females in all four of the P.R.F. groups to recall better than their male counterparts. In conjunction with this, is the finding that as a result of the shifting predominance in recall performance of one sex over the other between the P.R.F. groups in immediate memory, there were no significant overall sex differences ( $F(1,72) = 1.798, p > .05$ ). However, under the delayed retention condition where the females outperformed the males across all four P.R.F. groups, significant sex differences were observed ( $F(1,72) = 8.92, p < .01$ ). Thus, under delayed retention, although there were no significant P.R.F. group x sex interactions, there were significant overall sex differences, the females outperforming the males significantly.

#### Dependent Factors

List. An analysis of the dependent factors reveals several rather interesting differences in performance between immediate and delayed retention. The results indicate that although list 1 retention was superior to list 2 retention under the immediate recall condition ( $F(1,72) = 5.65, p < .05$ ), this difference, although evident, was not

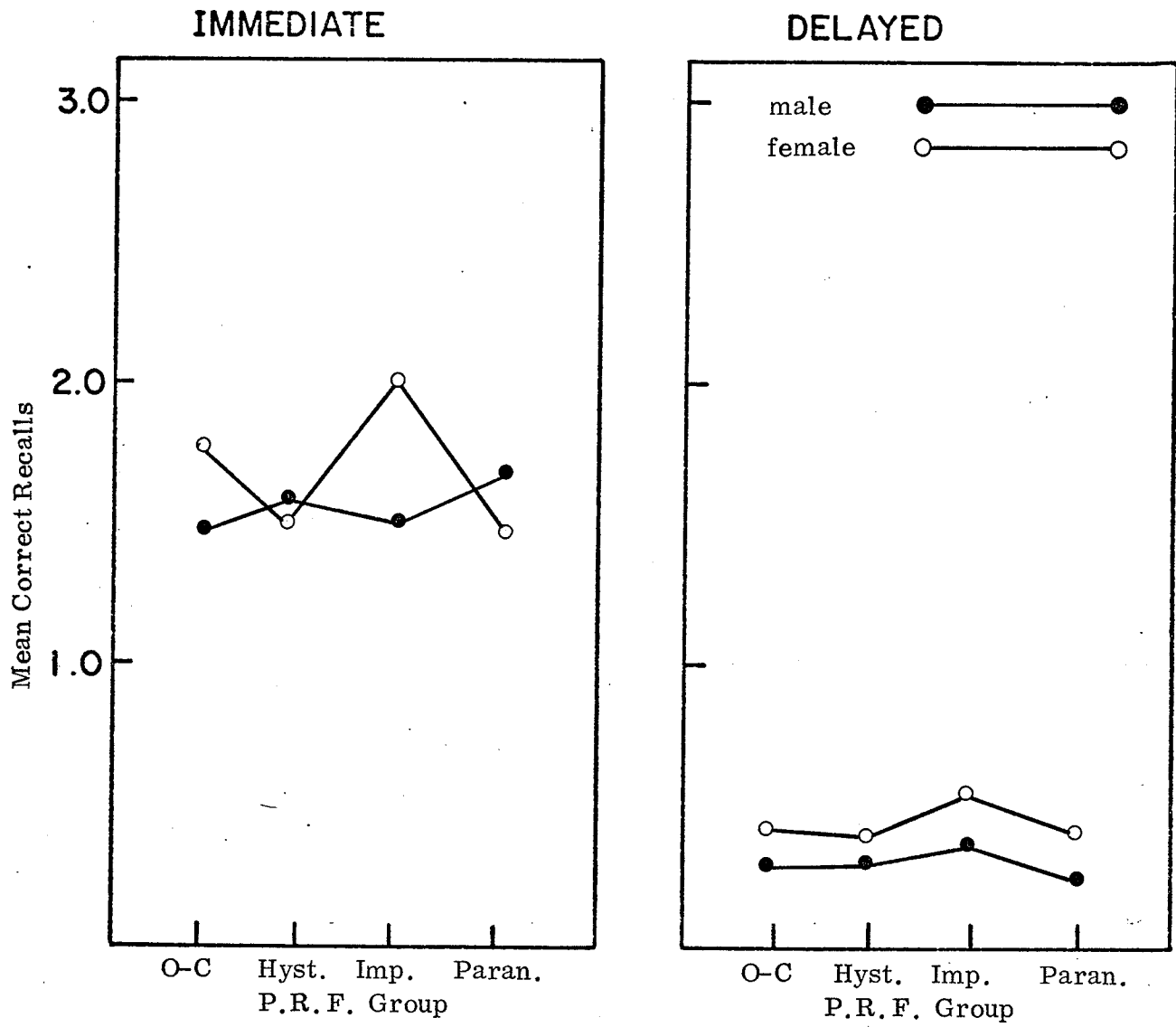


Figure 4. Mean number of correct recalls in immediate and delayed retention as a function of P.R.F. group and sex.

significant under delayed recall ( $F(1,72)=3.10$ ,  $p > .05$ ).

Learning Condition. The type of learning set (whether I or R) under which the learning task was approached proved to be an effective indicator of recall performance in both the immediate and delayed recall conditions. Imagery learning proved superior to repetition learning under both immediate ( $F(1,72)=800.62$ ,  $p < .001$ ) and delayed ( $F(1,72)=134.34$ ,  $p < .001$ ) recall conditions.

It is interesting to note also that while imagery study proved superior to repetition study over both retention periods, when observed in conjunction with a list distinction, significant list x learning condition interactions are evident in both immediate ( $F(1,72)=25.97$ ,  $p < .01$ ) and delayed ( $F(1,72)=13.02$ ,  $p < .01$ ) recall. Under both recall conditions, even though imagery study proved more effective than repetition study for both lists, more items learned under the repetition condition were recalled in list 2 than list 1. This is a reversal of what occurred under the imagery study condition where more items from list 1 were recalled, thus perhaps suggesting a learning strategy shift across lists. The results are presented in Figure 5.

Material. The type of material learned (pictures or words) also proved to effect retention significantly. The results indicate that pictures were recalled significantly more frequently than words in both immediate ( $F(1,72)=78.72$   $p < .01$ ) and delayed ( $F(1,72)=37.27$ ,  $p < .01$ ) recall. In conjunction with this, is the finding that the superiority of pictures over words for both retention conditions was maintained in both learning conditions. Picture recall proved superior to word recall for both imagery and repetition study under both immediate ( $F(1,72)=13.87$ ,  $p < .01$ ) and delayed ( $F(1,72)=13.61$ ,  $p < .01$ ) retention. These results are presented in Figure 6. As can be seen, repetition study proved most discriminative

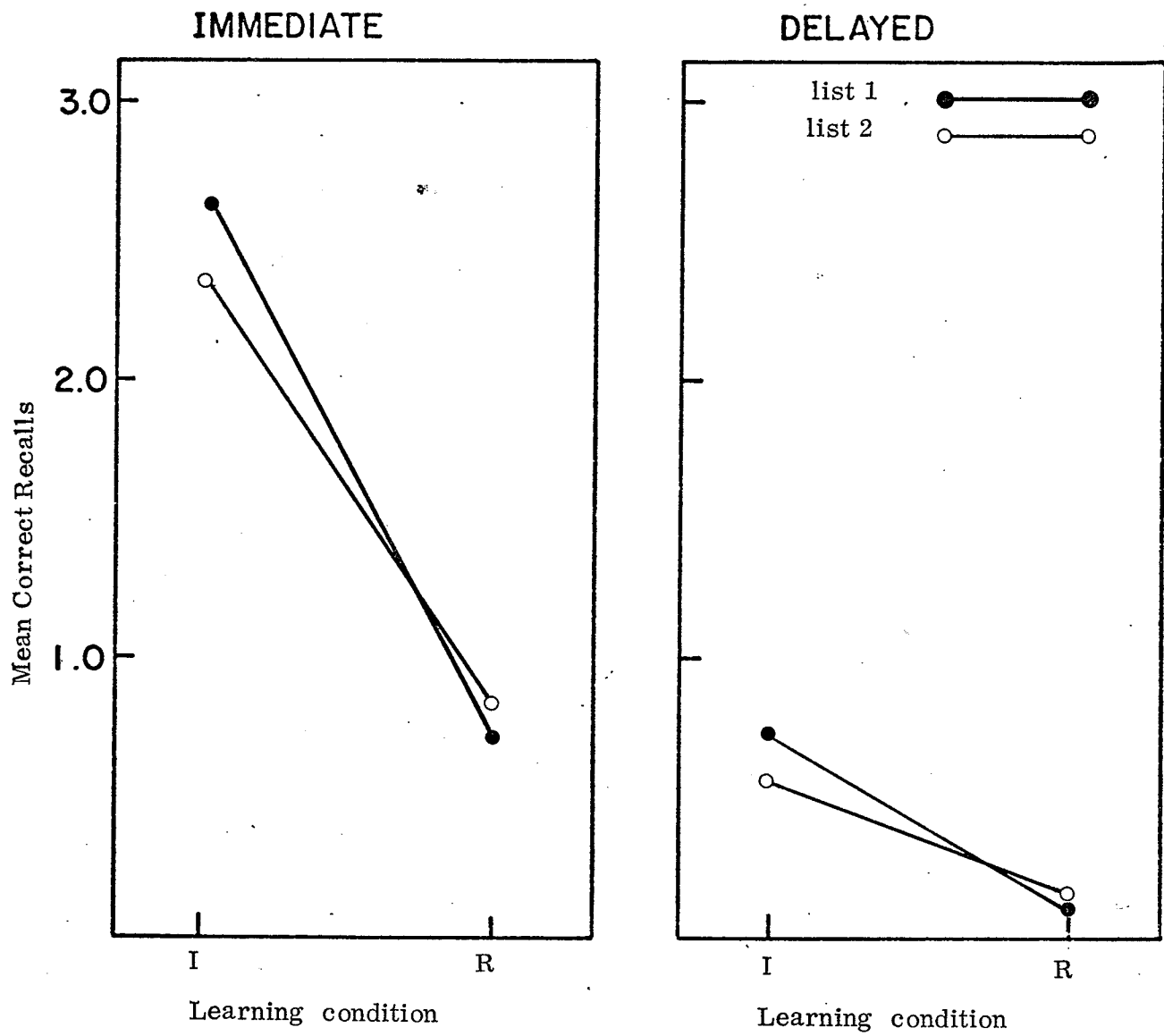


Figure 5. Mean number of correct recalls in immediate and delayed retention as a function of learning condition and list.

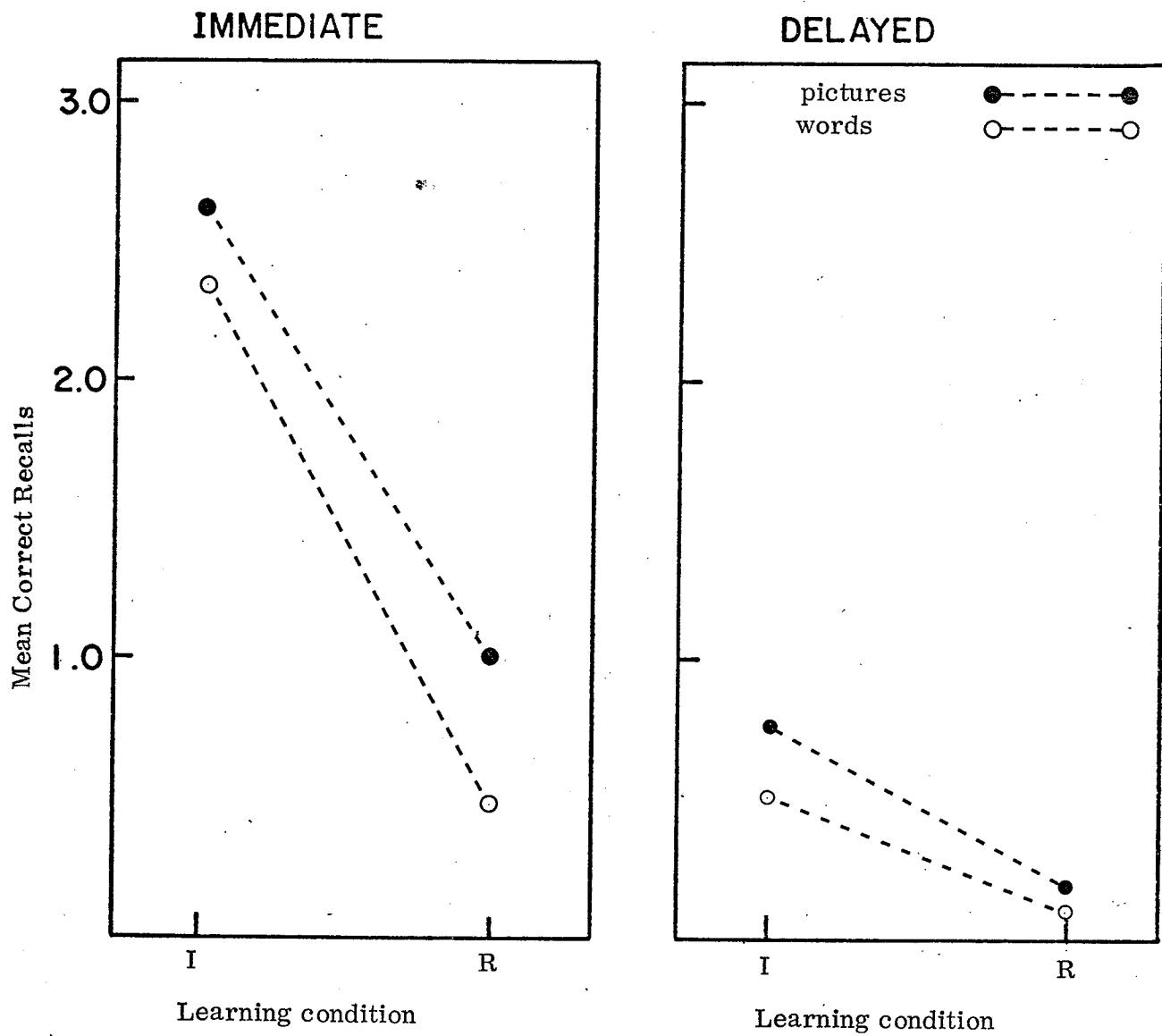


Figure 6. Mean number of correct recalls in immediate and delayed retention as a function of learning condition and materials learned.

of picture-word recall in immediate recall, whereas imagery study proved most discriminative in delayed recall.

A rather interesting finding was obtained from the interaction of list x learning condition x learning material, however these differences were significant only in immediate ( $F(1,72)=12.87$ ,  $p < .01$ ) recall. In general, the findings indicate that in both memory conditions pictures were recalled more frequently than words and imagery study resulted in superior recall than repetition study. However, as indicated in Figure 7, under the immediate recall condition, while recall decreased across lists for both pictures and words learned under imagery study, under repetition study, recall decreased only for words while increasing for pictures. Under delayed recall, number of items recalled across lists increased for both pictures and words learned under repetition study (although only slightly), while decreasing for both pictures and words learned under imagery study. Thus, although as pointed out earlier, there was a significant difference between recall of list 1 and list 2 under the immediate recall condition and only a trend toward this under delayed retention, some discrepancies are involved. It does appear, at least under delayed recall, that under repetition study recall increases across lists for both pictures and words. In immediate recall this increase only occurred for pictures, while word recall decreased. It should be emphasized that these findings in delayed retention should only be viewed as indicative of trends, since they do not reach statistical significance.

Concreteness-Abstractness. Whether the items learned were either concrete or abstract also had somewhat of an influence on learning and retention. Although there was only a trend in immediate recall for concrete items to be recalled more frequently than abstract ( $F(1,72)=2.89$ ,  $p > .05$ ), significant differences were observed in delayed retention where

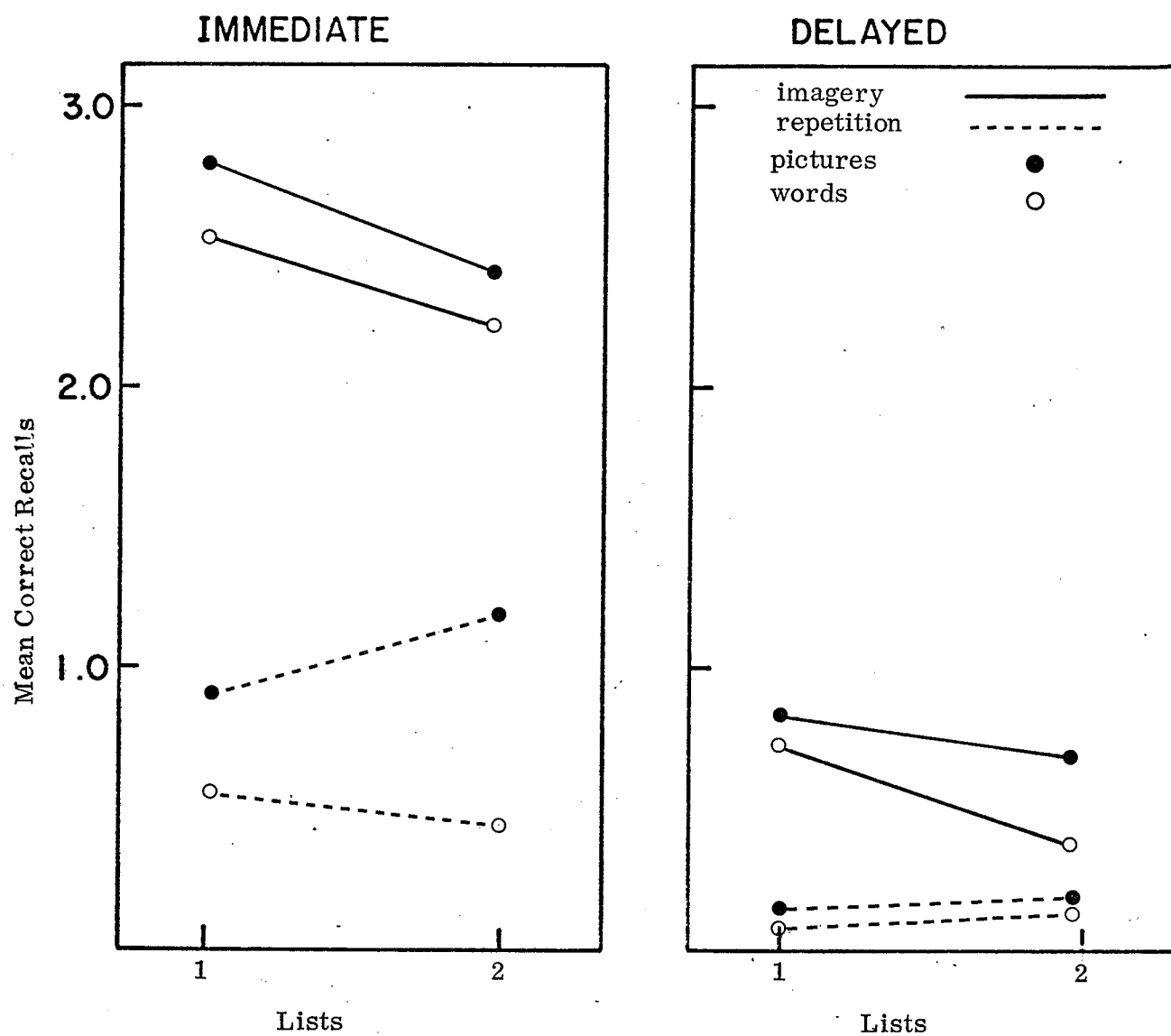


Figure 7. Mean number of correct recalls in immediate and delayed retention as a function of learning condition, materials learned and list.

the concrete items showed a clear superiority over the abstract items ( $F(1,72)=8.06$ ,  $p<.01$ ). In conjunction with this is the finding that the dominance of concrete over abstract items in recall seems to increase from list 1 to list 2. This is especially seen in immediate memory where a reversal occurs (see Figure 8). Whereas abstract items show superior recall to concrete items in list 1, this is reversed in list 2 where the concrete items are clearly superior to the abstract items ( $F(1,72)=75.41$ ,  $p<.01$ ). This is not observed in the delayed retention condition where the superiority of concrete items over abstract items is maintained across both lists ( $F(1,72)=13.80$ ,  $p<.01$ ).

The results also indicate a significant interaction between the learning condition employed (I or R) and the concreteness or abstractness of the items learned. Under the immediate recall condition concrete items were recalled most frequently under imagery study, whereas the abstract items showed a clear superiority under repetition study ( $F(1,72)=294.39$ ,  $p<.001$ ). Under the delayed recall condition this same reversal occurred across the learning conditions, however, to a lesser degree. Whereas concrete items were recalled more frequently under imagery study, and the abstract items more frequently under repetition study, the difference, although significant ( $F(1,72)=15.73$ ,  $p<.01$ ), was largely due to the clear superiority of concrete items over abstract items under imagery study. As can be seen from Figure 9, although abstract items are recalled more frequently than concrete items under repetition study, the difference is only slight. In comparison to the wide difference in favour of abstract items under the immediate recall condition, the differential effects of repetition study on either concrete or abstract items can be seen as tending towards an approximation.

In conjunction with this are the results from the three way inter-

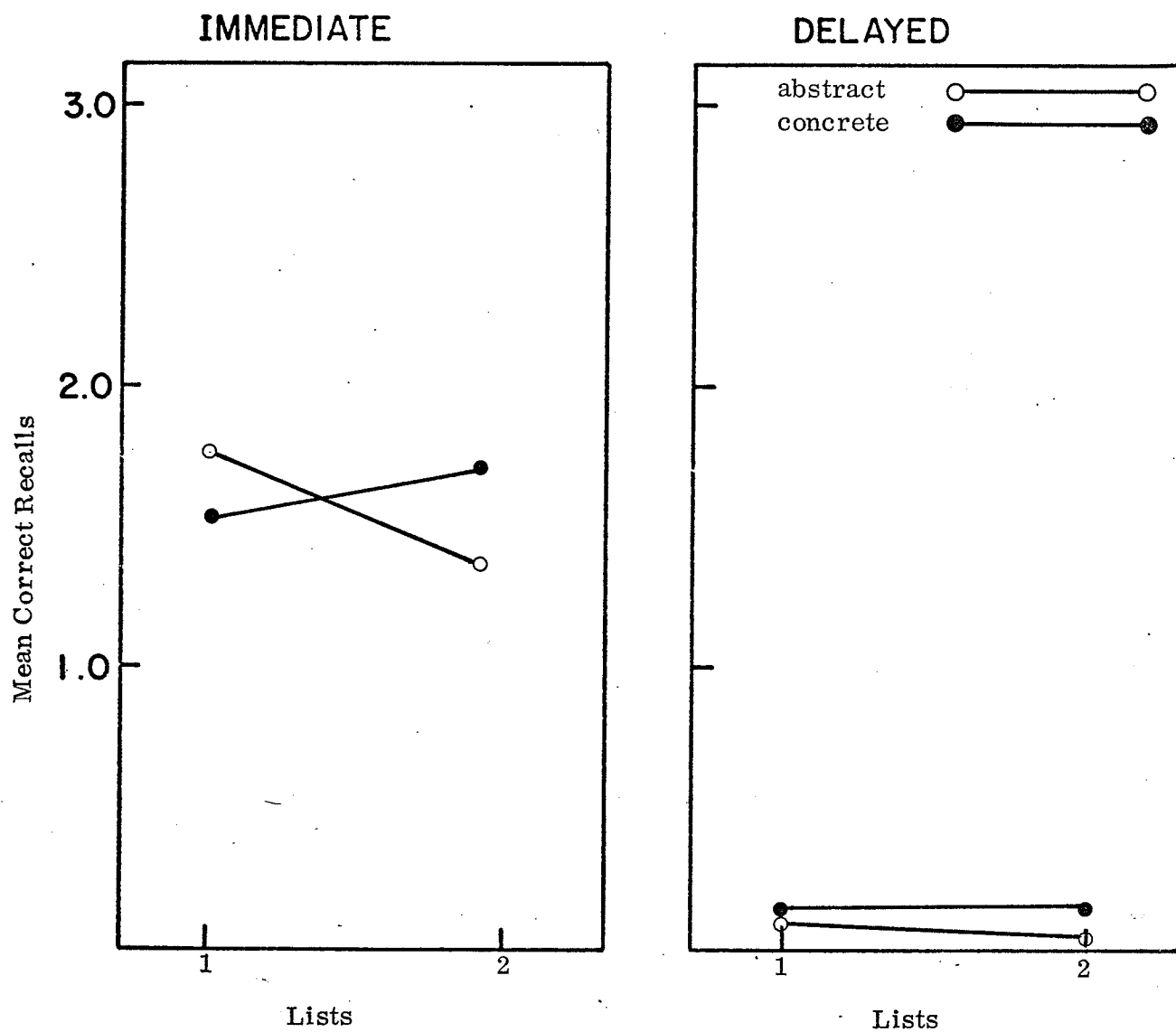


Figure 8. Mean number of correct recalls in immediate and delayed retention as a function of list and concreteness-abstractness.

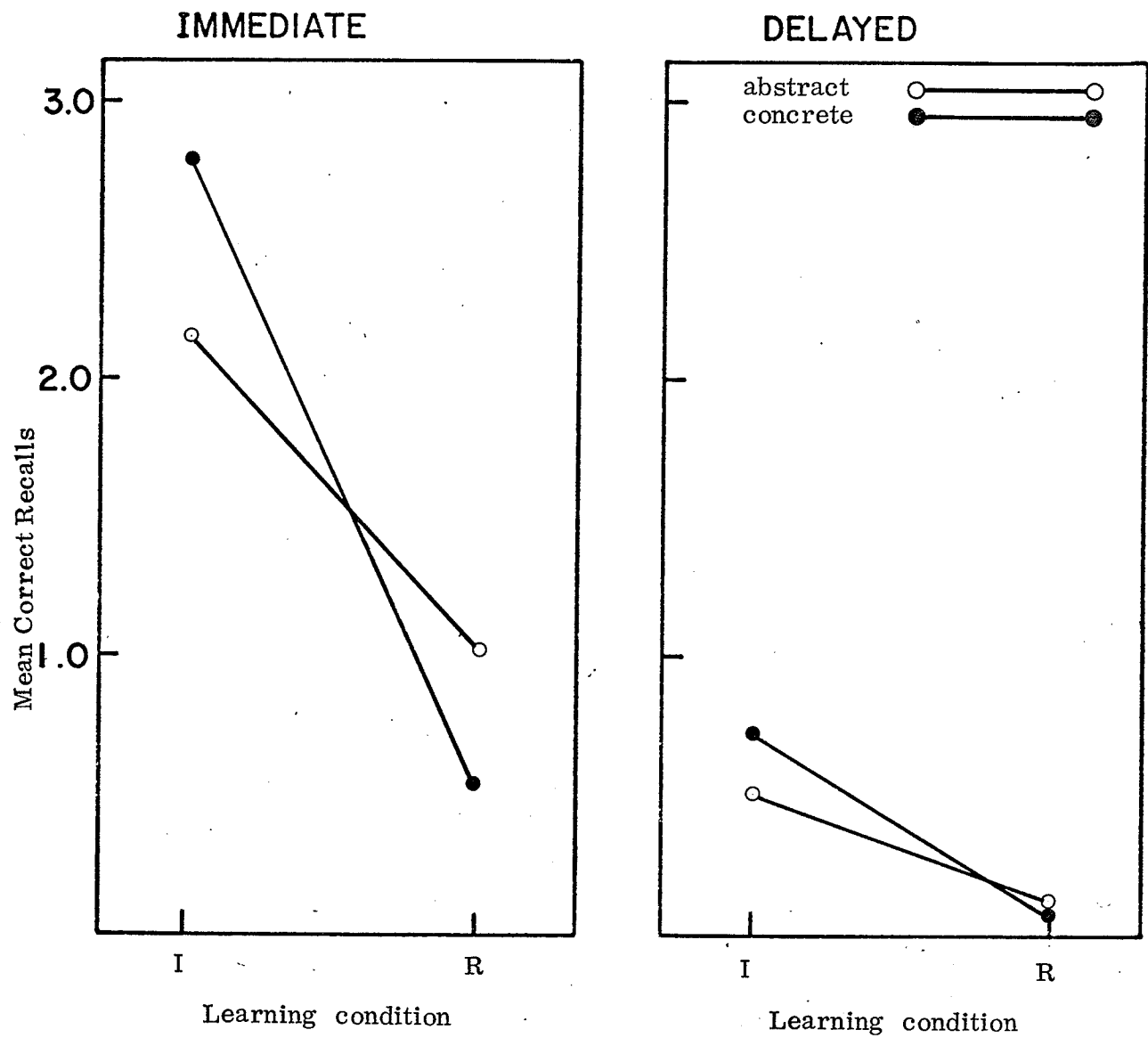


Figure 9. Mean number of correct recalls in immediate and delayed retention as a function of learning condition and abstractness-concreteness.

action involving list x learning condition x concreteness-abstractness. These are presented in Figure 10. While reaching significance only under the immediate recall condition [ $F(1,72)=16.20$ ,  $p<.01$ ], (for delayed retention,  $F(1,72)=3.47$ ,  $p>.05$ )] several rather interesting trends are suggested. In the immediate recall condition, imagery study remained superior to repetition as a learning strategy; however, the concrete items which proved superior in imagery recall were recalled less under repetition study. Thus, it seems that abstract items were learned and recalled more frequently under repetition study whereas the reverse is true under imagery study. Combined with this is the observation that under both imagery and repetition study abstract items showed a greater decline from list 1 to list 2 while the number of concrete items recalled increased across the lists. It should be emphasized that the observed decline across lists in abstract items learned under the repetition condition was only slight. Thus in list 2 a significantly greater number of abstract items over concrete items were still recalled. This was not true of recall under delayed retention where, by list 2, the concrete items learned under both imagery and repetition were recalled more frequently than the abstract items. However, since the differences in delayed recall were not significant, this can only be posited as a trend.

The interaction of materials learned and concreteness-abstractness also proved to be significant, not only in immediate ( $F(1,72)=40.56$ ,  $p<.01$ ) but also in delayed ( $F(1,72)=12.49$ ,  $p<.01$ ) recall. As can be seen from Figure 11, both abstract and concrete pictures were recalled more frequently than abstract and concrete words in both retention conditions. It seems significant, however, that while concrete words were more frequently recalled than abstract words in both recall conditions, the same was not true of picture recall. Under immediate recall conditions

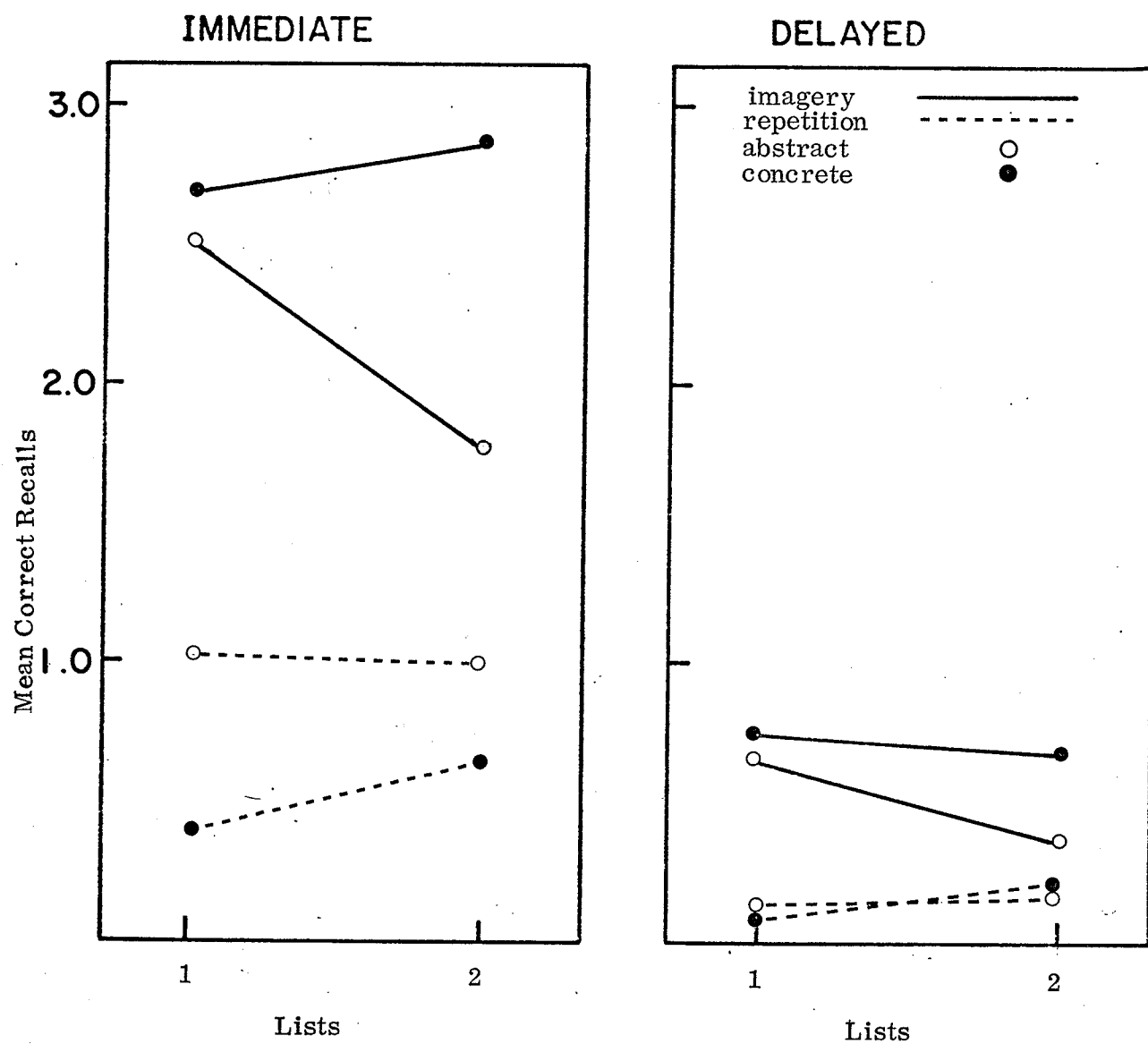


Figure 10. Mean number of correct recalls in immediate and delayed retention as a function of learning condition, list and abstractness-concreteness.

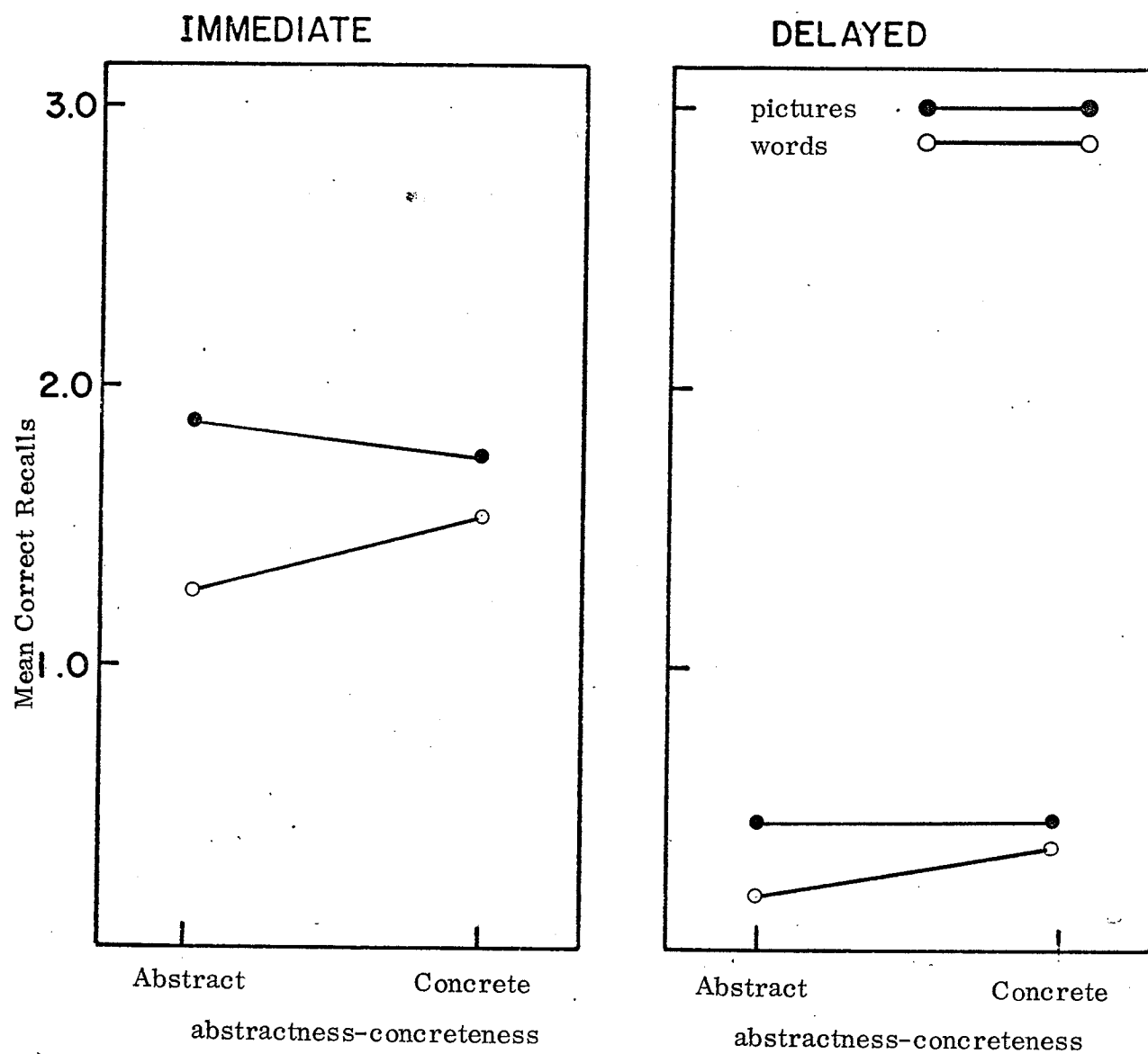


Figure 11. Mean number of correct recalls in immediate and delayed retention as a function of materials learned and abstractness-concreteness.

abstract pictures were more frequently recalled than concrete pictures, whereas under delayed recall the concrete pictures were more frequently recalled than the abstract pictures even though the difference was only slight.

#### Independent-Dependent Interactions

An analysis of the independent x dependent factors provides data regarding the learning and retention characteristics of the various P.R.F. groups. As such, any performance differences can be attributed to the specific independent factor under question. The P.R.F. group x list interaction indicated a significant interaction in immediate recall ( $F(3,72)=3.69$ ,  $p < .05$ ) but not in delayed recall. As can be seen from Figure 12, while the impulsive, obsessive-compulsive, and hysterical groups showed a decrease in recall from list 1 to list 2, the paranoid group showed an increase across lists. The paranoid group, therefore, while showing the lowest recall of all groups on list 1, by list 2 shows the second highest recall. This can be seen as a function of both the decreases in recall observed across lists for the other groups and the slight increase in recall across lists shown by the paranoid group. The impulsive group showed the highest recall on both lists; the obsessive-compulsive was intermediate on both; and the hysteric group gave a rather poor showing, ranking third out of the four groups on recall of list 1 and ranking last on list 2.

Another significant interaction occurred between sex and list; this was significant only under the immediate recall condition ( $F(1,72)=5.35$ ,  $p < .05$ ). An analysis of Figure 13 indicates that while females recalled more than males on both lists 1 and 2, they did not show as much loss from list 1 to list 2 as did the males. As such there was a greater

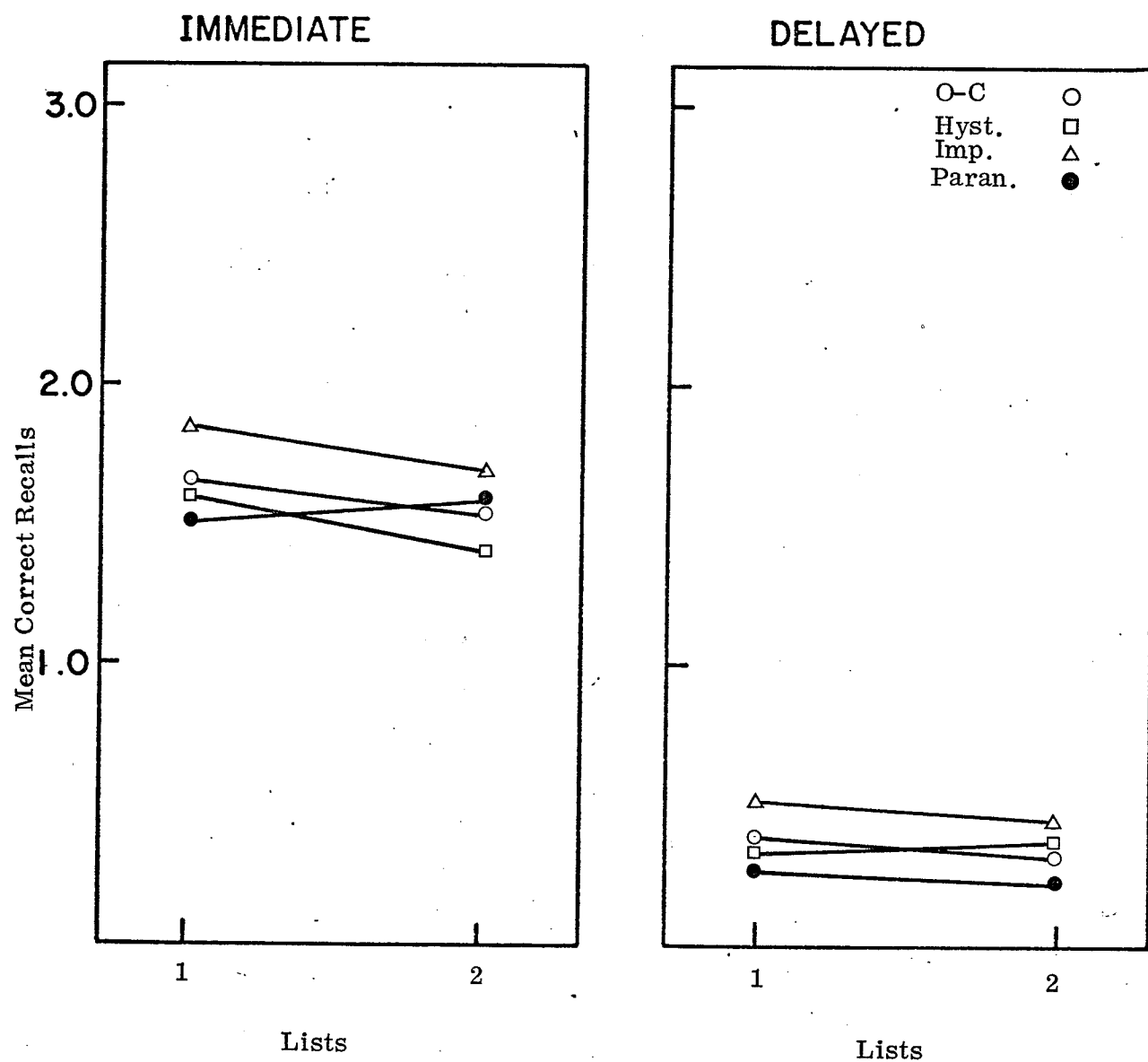


Figure 12. Mean number of correct recalls in immediate and delayed retention as a function of P.R.F. group and list.

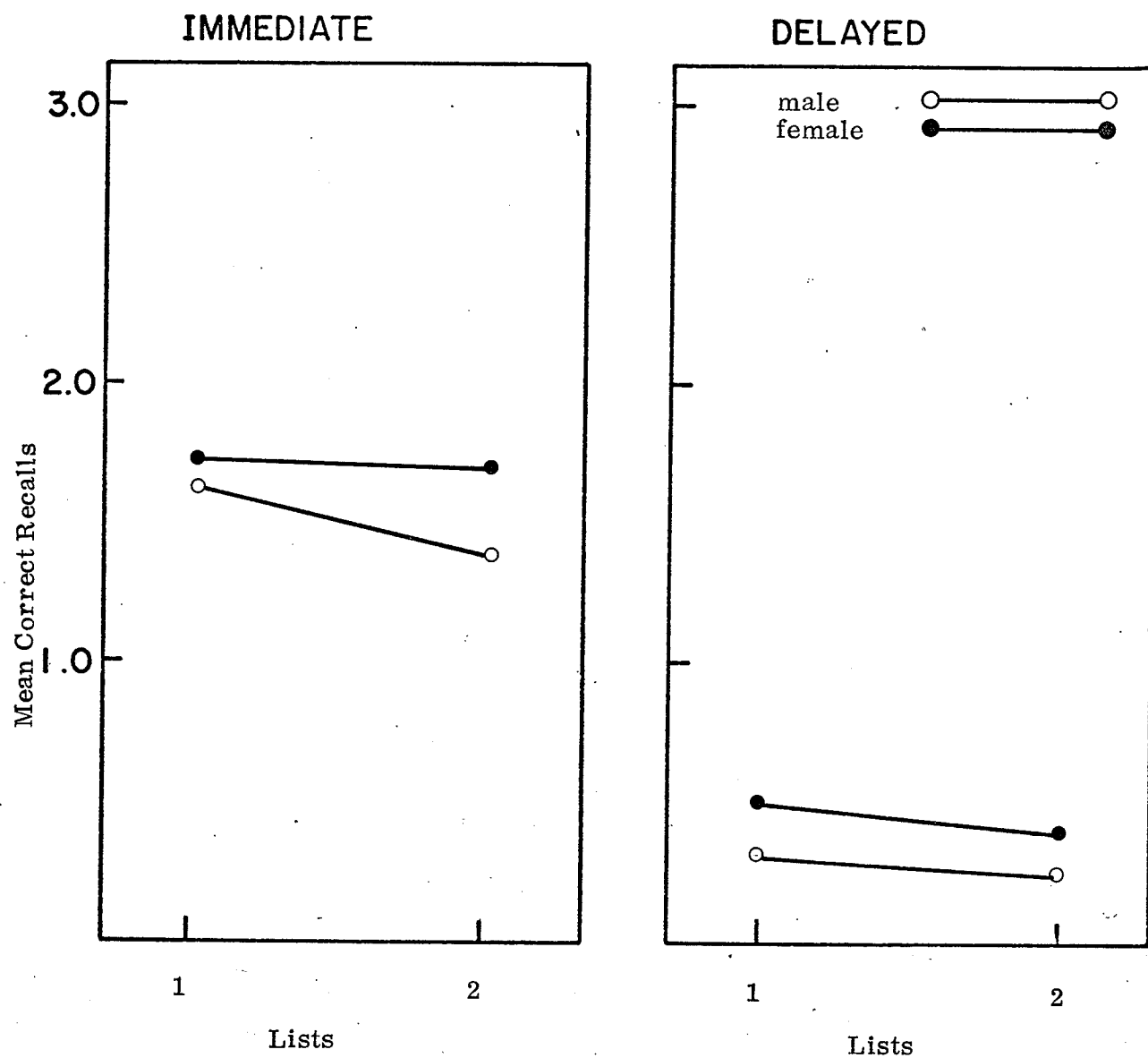


Figure 13. Mean number of correct recalls in immediate and delayed retention as a function of sex and list.

difference between male-female recall on list 2 than list 1. Under delayed recall, there is an indication that both sexes show a much more similar deterioration across lists, even though the females still outperformed the males.

Another interaction involving sex differences occurred between sex and learning condition. This was significant only under the delayed retention condition ( $F(1,72)=6.32$ ,  $p < .05$ ). Figure 14 indicates that while both sexes showed a comparable decrease in retention across learning conditions in immediate recall, males showed a much greater loss across memory conditions in imagery study than did females. Thus while both sexes showed a similar decline in repetition learned items across retention periods, the males seemed to 'lose' more imagery learned items over the one week interval than did the females.

The sex x list x learning condition interaction also showed significance, but only under immediate recall ( $F(1,72)=6.95$ ,  $p < .05$ ). From Figure 15 it can be seen that while females maintained their superior recall over males under both imagery and repetition study and across both lists, the relative difference between the sexes was much less under repetition study than under imagery. Another interesting phenomenon is in terms of learning strategies employed across lists. While both males and females showed a decreased performance from list 1 to list 2 under imagery study and under both retention conditions, the reverse is true of recall under repetition study where there was an increase in recall of both sexes from list 1 to list 2 and under both retention periods.

Sex also appeared to have an influence on the type of material that was learned (pictures or words), there being a significant interaction between sex and materials learned in immediate ( $F(1,72)=5.50$ ,  $p < .05$ ) but not delayed recall. An analysis of Figure 16 indicates that

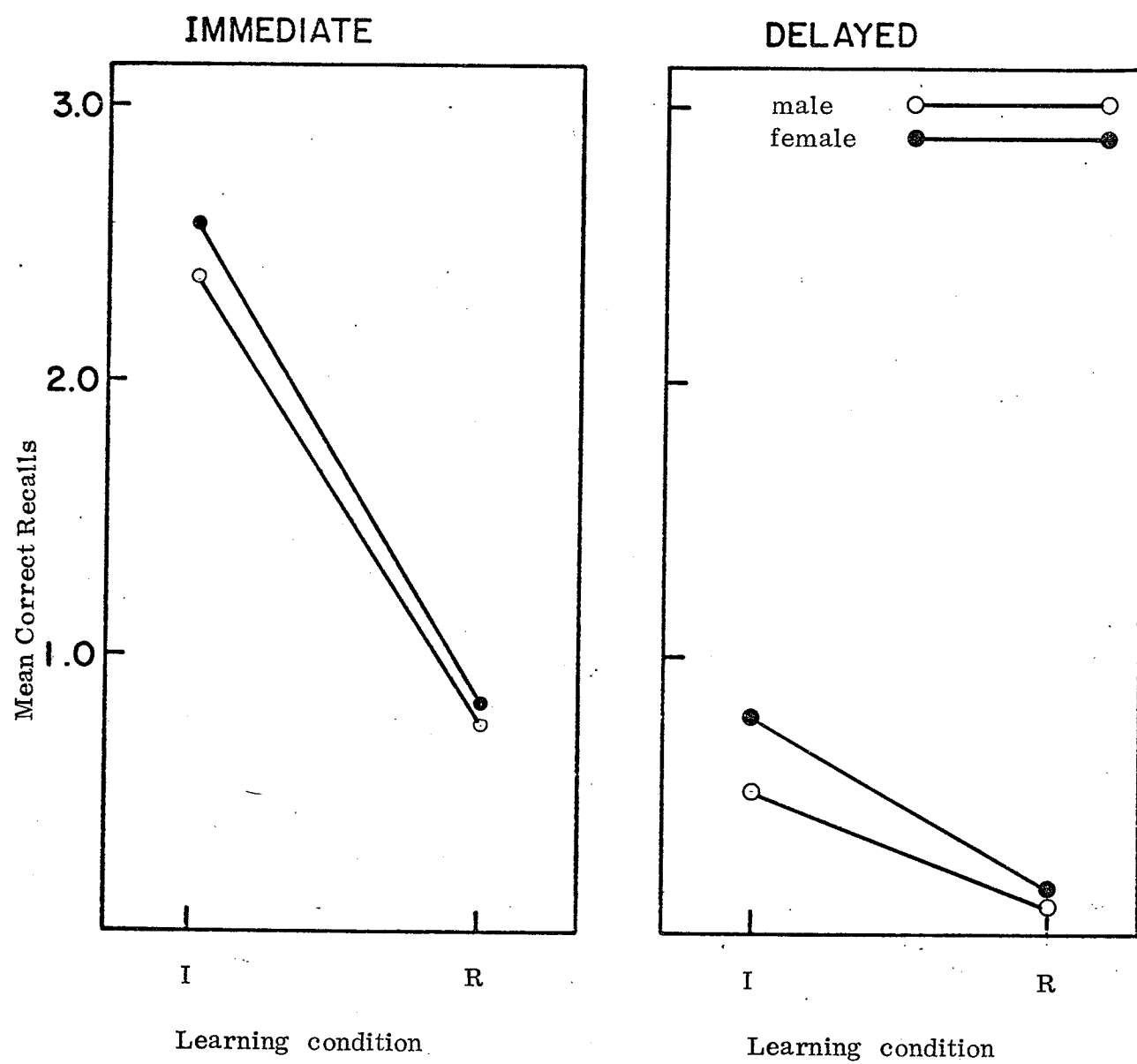


Figure 14. Mean number of correct recalls in immediate and delayed retention as a function of learning condition and sex.

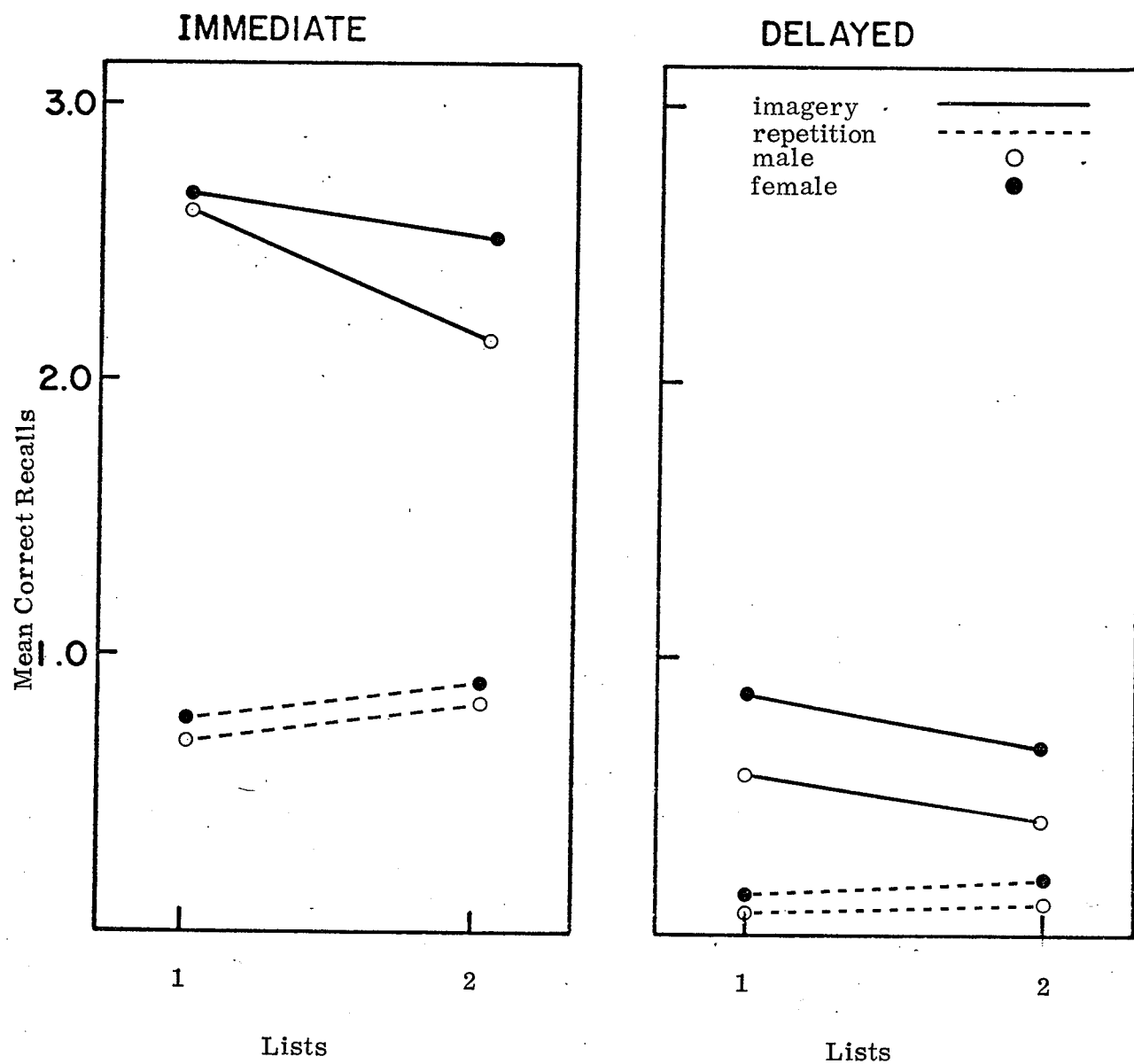


Figure 15. Mean number of correct recalls in immediate and delayed retention as a function of sex, learning condition and list.

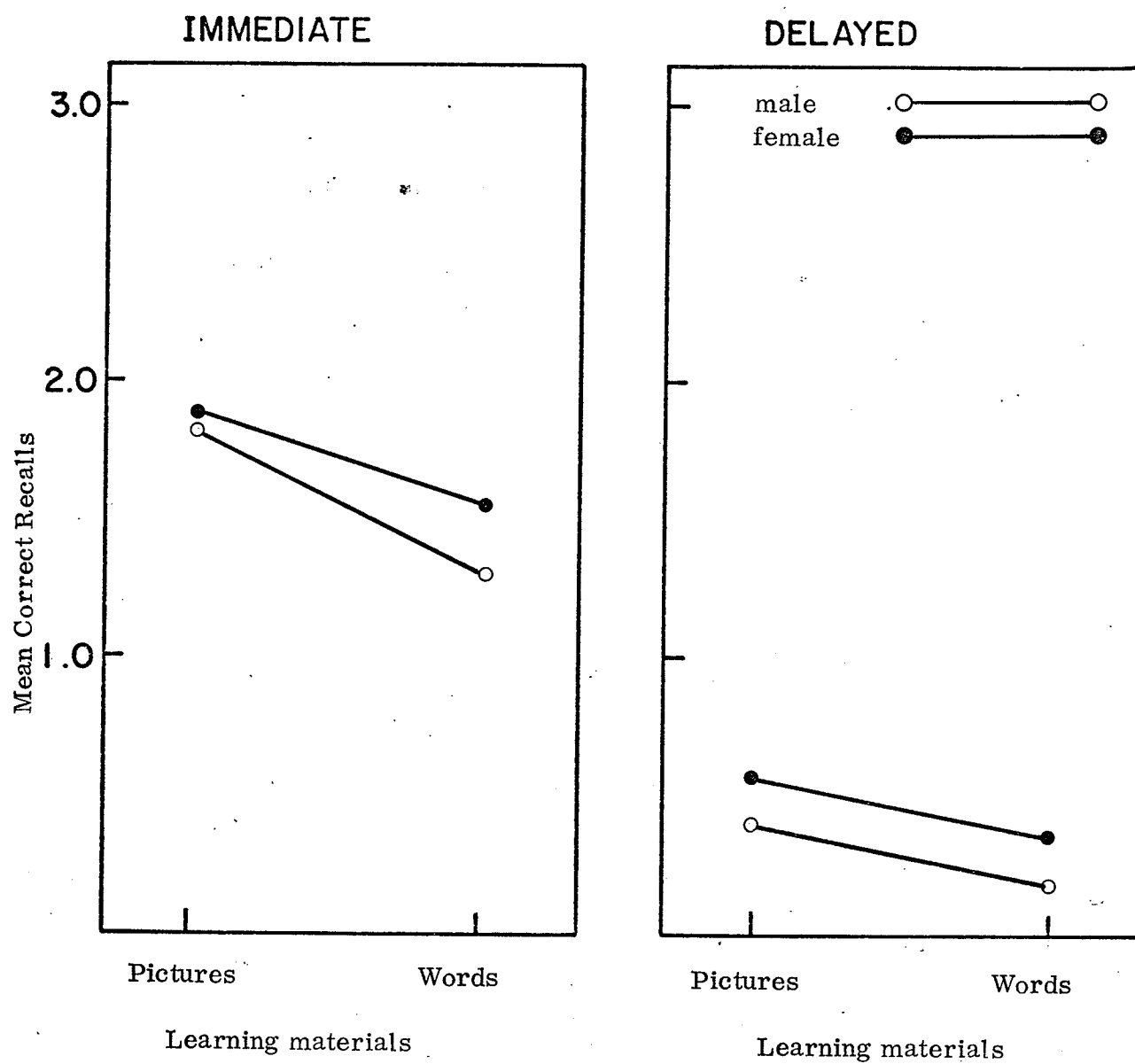


Figure 16. Mean number of correct recalls in immediate and delayed retention as a function of sex and materials learned.

while females only outperformed males slightly in the retention of pictures they clearly showed a greater retention of words. This difference was only obvious under immediate recall; in the delayed retention condition females maintained a very similar superiority over males in both the recall of pictures and words.

Some rather revealing findings were obtained from the list x level x material learned interaction. In both the immediate ( $F(2,72)=8.08$ ,  $p<.01$ ) and delayed ( $F(2,72)=4.16$ ,  $p<.05$ ) retention conditions significant results were obtained. An analysis of Figure 17 indicates that under immediate retention, recall of pictures for the average and low levels of the combined P.R.F. groups decreased from list 1 to list 2 while the high level increased. This is in contrast to the retention of words, where for the high and average levels, recall decreased across lists while the recall of the low level increased. Thus under immediate recall from list 1 to list 2 the average level decreased in performance on both pictures and words; the low level decreased in recall of pictures but increased in recall of words; and the high level increased in recall of pictures but decreased in recall of words. Under delayed retention, similar patterns of functioning were evident, although to a lesser degree. Picture recall from list 1 to list 2 decreased for the low level, decreased only slightly for the average level, and increased slightly for the high level. Greater differences were observed in word recall where there was a decrease for both the high and average levels and an increase for the low level. The results seemed to indicate, therefore, that the differential pattern of functioning between levels was consistent over both retention periods.

The abstractness or concreteness of the items learned appeared to have an influence on retention among the four P.R.F. groups, although this

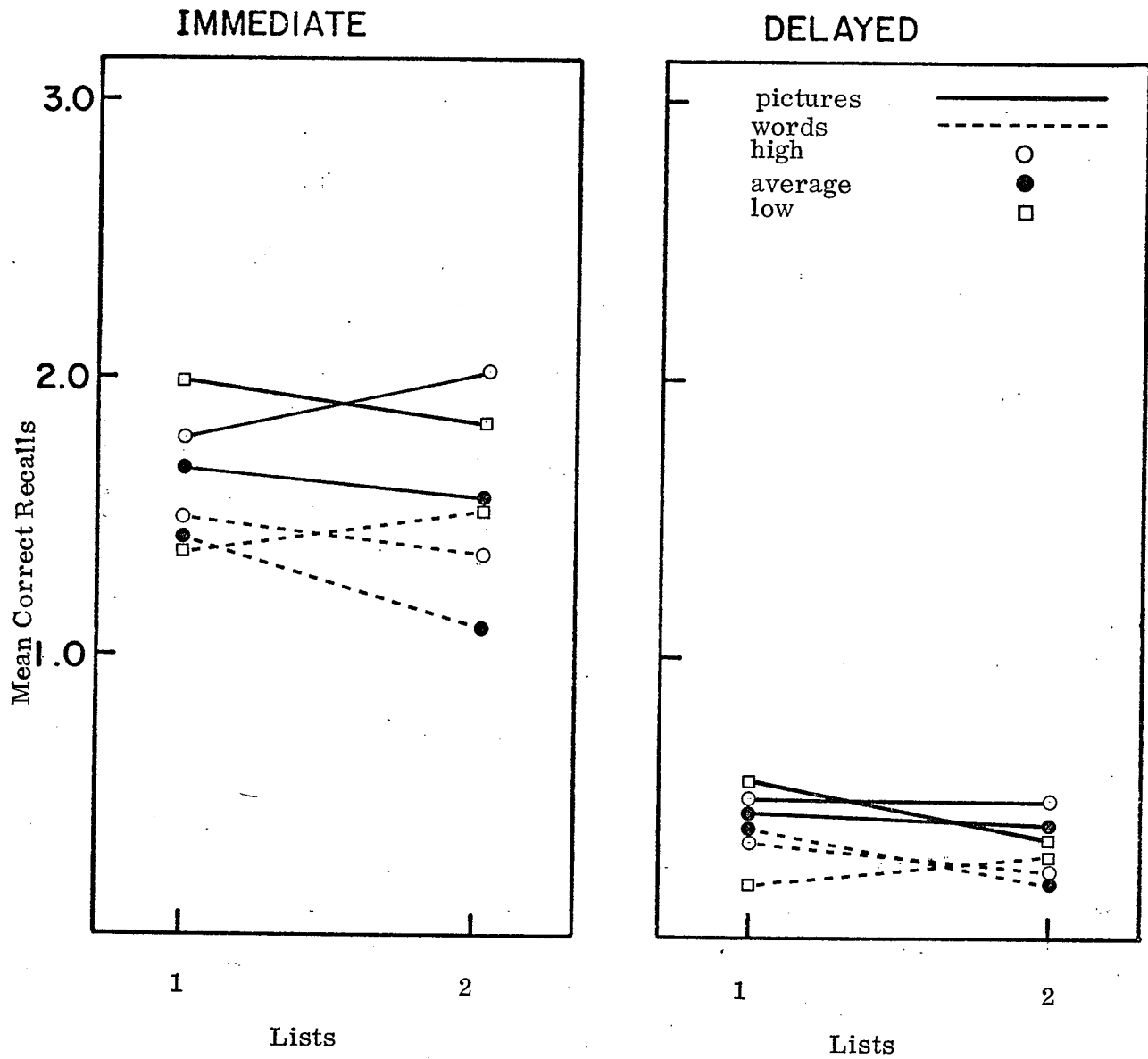


Figure 17. Mean number of correct recalls in immediate and delayed retention as a function of materials learned, level and list.

was only significant under immediate recall ( $F(3,72)=4.04$ ,  $p < .05$ ).

From Figure 18 it can be seen that in immediate recall the abstract items were recalled most frequently by the impulsive group who also ranked second of the four P.R.F. groups in the recall of concrete items. It should be pointed out also that while the three other P.R.F. groups recalled more concrete items than abstract, the impulsive group showed a tendency to recall more abstract items than concrete. The obsessive-compulsive group ranked second in the recall of abstract items and third in the recall of concrete items; the hysteric group ranked third in the recall of abstract items and last in the recall of concrete items; and the paranoid group, while ranking last in the recall of abstract items, ranked first in the recall of concrete items. Thus, there appears to be a differential functioning of the four P.R.F. groups in terms of the concreteness or abstractness of the items learned. The impulsive group performed consistently well with both concrete and abstract items; the hysteric group performed consistently low on both concrete and abstract items; the obsessive-compulsive group performed about 'average' on both types of items; and the paranoid group performed a complete reversal, showing the poorest performance on the abstract items and the best performance on the concrete items.

In conjunction with this is the differential performance on either abstract or concrete items as a function of level. An analysis of the level x concreteness-abstractness interaction indicates that significant differences were obtained under the immediate memory condition ( $F(2,72)=5.19$ ,  $p < .01$ ). From Figure 19, it can be seen that the low level ranked first in the recall of abstract items and second in the recall of concrete items; the high level ranked second in the recall of abstract items and first in the recall of concrete items; and the average

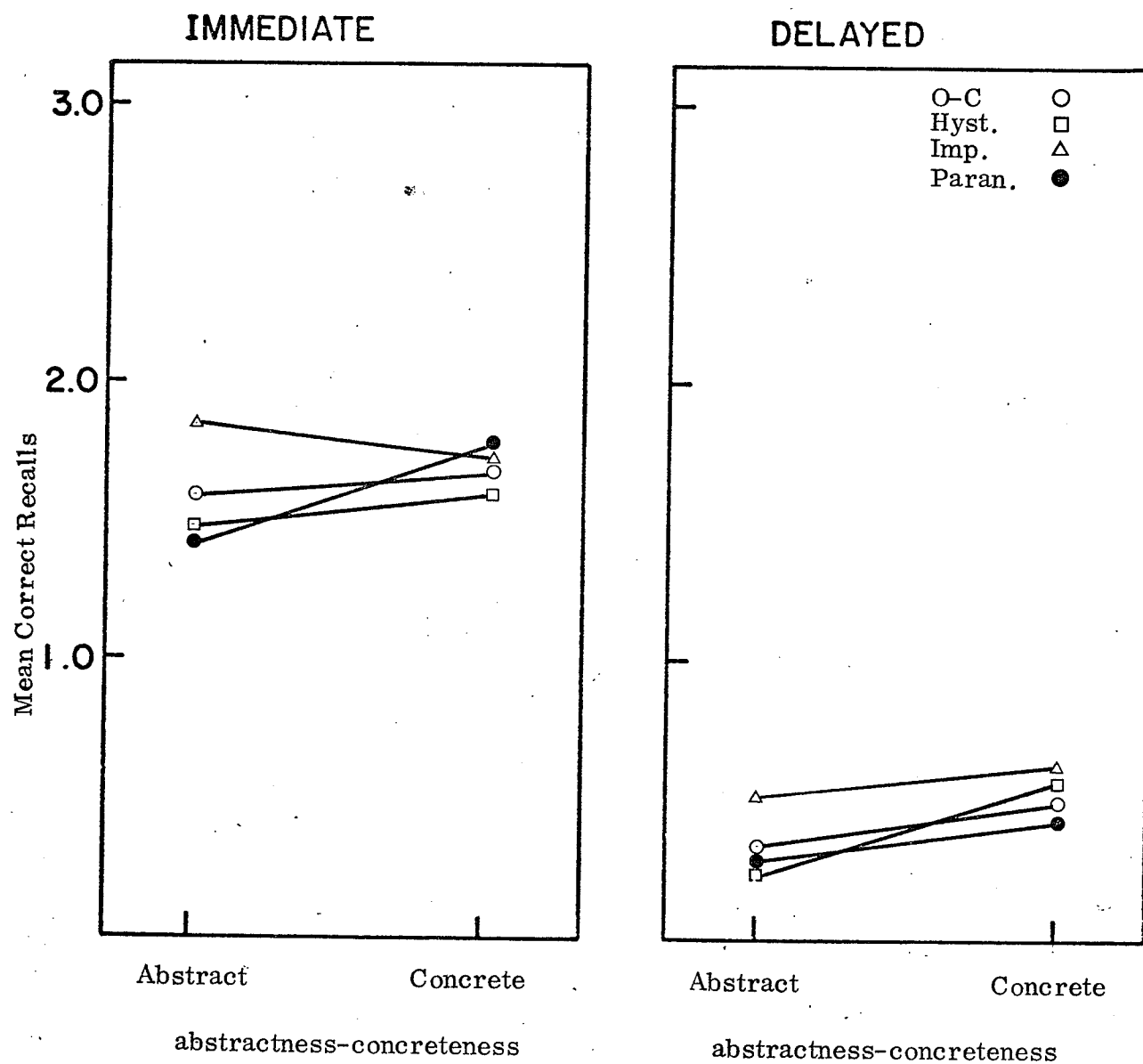


Figure 18. Mean number of correct recalls in immediate and delayed retention as a function of P, R, F, group and abstractness-concreteness.

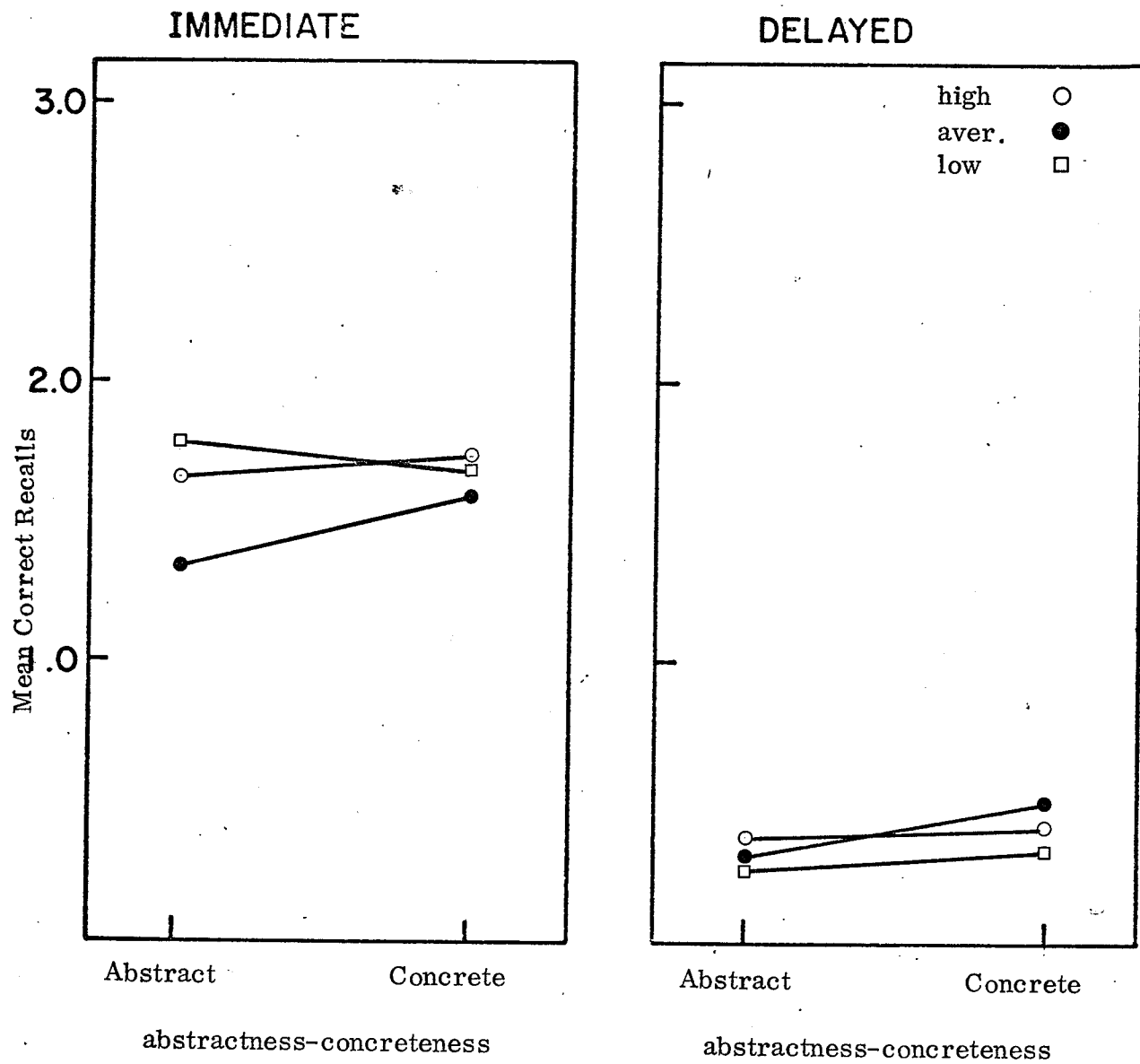


Figure 19. Mean number of correct recalls in immediate and delayed retention as a function of level and abstractness-concreteness.

level ranked last in the recall of both abstract and concrete items. Thus, it appears that level also may be an indicator of functioning, with the high and low levels showing a greater recall than the average level.

Related to the above is the interaction between sex, learning condition, and abstractness-concreteness, which was significant under immediate recall ( $F(1,72)=6.29, p<.05$ ) but not under delayed recall ( $F(1,72)=3.65, p>.05$ ). Thus it can be seen from Figure 20 that while imagery study was superior to repetition study for both sexes and for both the concrete and abstract items, several interactions occurred. Females showed superior recall to males for the abstract items under both imagery and repetition study. On the concrete items, however, while the females maintained a greater recall under imagery study, the males showed a greater recall under repetition study. Thus a reversal did occur between the sexes in terms of the applicability of learning strategies for the concrete items.

It should be emphasized that in all of the above results, except in those cases where the effect of level was specifically mentioned, any effect of PRF group was due to the combination of all three levels (high, average, low). For this reason the results presented above (except where specific mention is made of any effect due to the 'high level') cannot be interpreted as resulting solely from any effect of 'cognitive style', since by definition the 'high' level of each PRF group is the only level characterized by the specific 'cognitive style' of any one PRF group. Thus, the above results can only be interpreted in terms of general 'PRF group characteristics'. Any effect of 'style' (by definition) would be mainly limited to the high level of each group. For this reason the effects of level were presented in a separate analysis, and any effect of 'high' level on the other factors was viewed as indicative of effects due to 'style'.

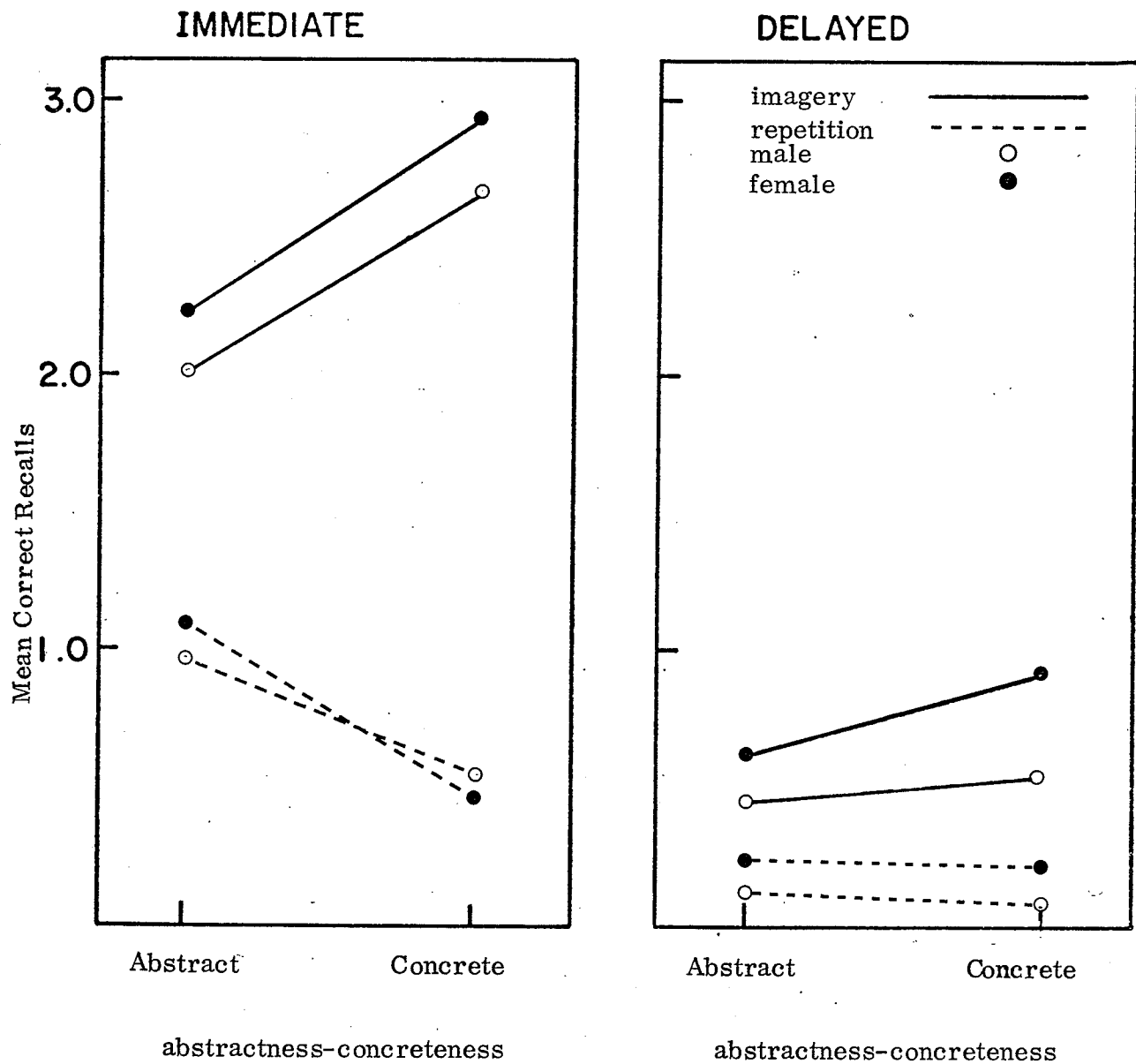


Figure 20. Mean number of correct recalls in immediate and delayed retention as a function of sex, learning condition and abstractness-concreteness.

The Effect of Level. An analysis of the data by level (high, average, low) indicates several rather interesting differences in functioning according to whether there was a 'preponderance' or 'lack of' the particular 'style' investigated. Although none of the independent factors considered separately reached statistical significance, numerous significant interactions were observed not only in the dependent variables but also in the independent x dependent interactions. These indicated a differential functioning between the levels which were suggestive of a personality 'style' influence among the PRF groups. The factors that reached statistical significance at each level are presented in Appendix 9.

As can be seen, in the high level (where the identified PRF groups can be interpreted as expressing particular 'styles' of functioning) there was a significant interaction between PRF group x learning condition x learning material ( $F(9, 72) = 2.87, p < .01$ ). This seemed indicative of a differential functioning according to PRF group as a function of 'style' influences. From Figure 21, it seems indicated that for abstract-picture items under imagery study the impulsive 'style' showed the best performance, followed by the paranoid, hysteric and obsessive-compulsive 'styles'. Under repetition study, however, the obsessive-compulsive showed the superior performance, followed by the impulsive, hysteric, and paranoid 'styles'. Thus, for abstract pictures, a reversal did occur; the obsessive-compulsive 'style' which showed the poorest performance under imagery study, performed best under repetition study. The impulsive 'style' maintained a superiority over both learning conditions, showing the best performance under imagery study and showing the second best performance under repetition study.

Recall of the concrete-picture items showed a somewhat different

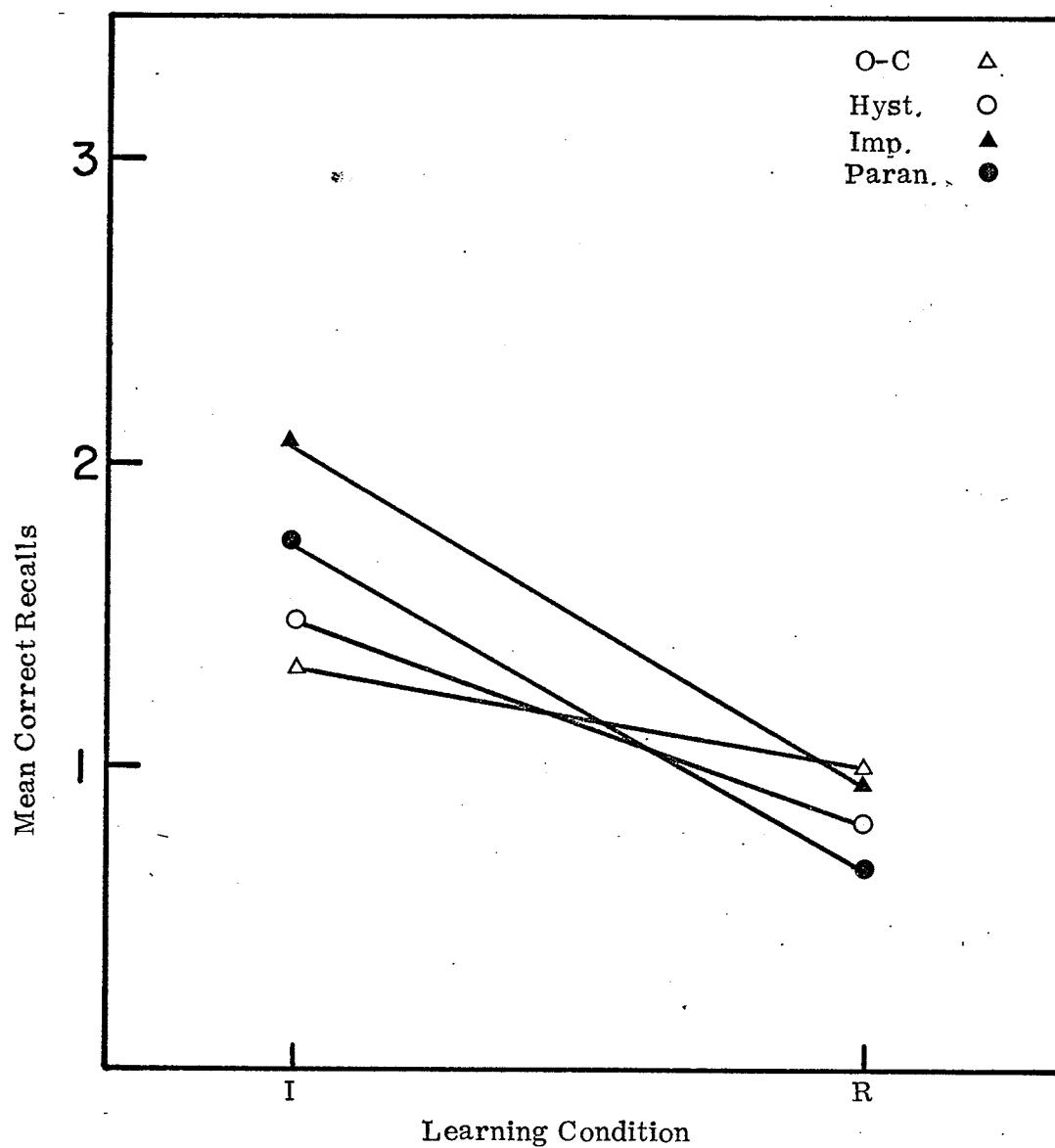


Figure 21. Mean number of correct recalls of abstract picture items as a function of P R F group and learning condition.

pattern of performance. From Figure 22, it can be seen that under imagery study the obsessive-compulsive 'style' showed superior performance, followed by the impulsive, paranoid, and hysteric 'styles'. Under repetition study, a reversal did occur whereby the paranoid 'style' showed the superior performance, followed by the hysteric, obsessive-compulsive, and impulsive 'styles'. Thus, in the learning of concrete pictures, learning condition employed seemed to be a rather significant predictor of 'stylistic' functioning.

The use of words as a learning material also appeared to be indicative of differential functioning. Figure 23 indicated that abstract word items learned under imagery study were best recalled by the impulsive 'style', followed by the obsessive-compulsive, hysteric, and paranoid 'styles'. Under repetition study, on the other hand, the superior recall was shown by the obsessive-compulsive 'style', followed by the hysteric, impulsive and paranoid 'styles' (the impulsive and paranoid 'styles' showed a tied performance). Thus, once again, a reversal occurred between the 'styles' across the learning conditions. It seems important to realize that, as in their performance on the abstract pictures, the obsessive-compulsive 'style' showed an increase in rank position from imagery study to repetition study. It appears that the obsessive-compulsive 'style' does not show as great a deterioration in recall of abstract items under repetition study as do the other three 'styles'.

The concrete word items also were indicative of a reversal in performance across learning conditions among the 'styles'. Figure 24 indicates that under imagery study the obsessive-compulsive 'style' showed the best performance, followed by the paranoid, impulsive, and

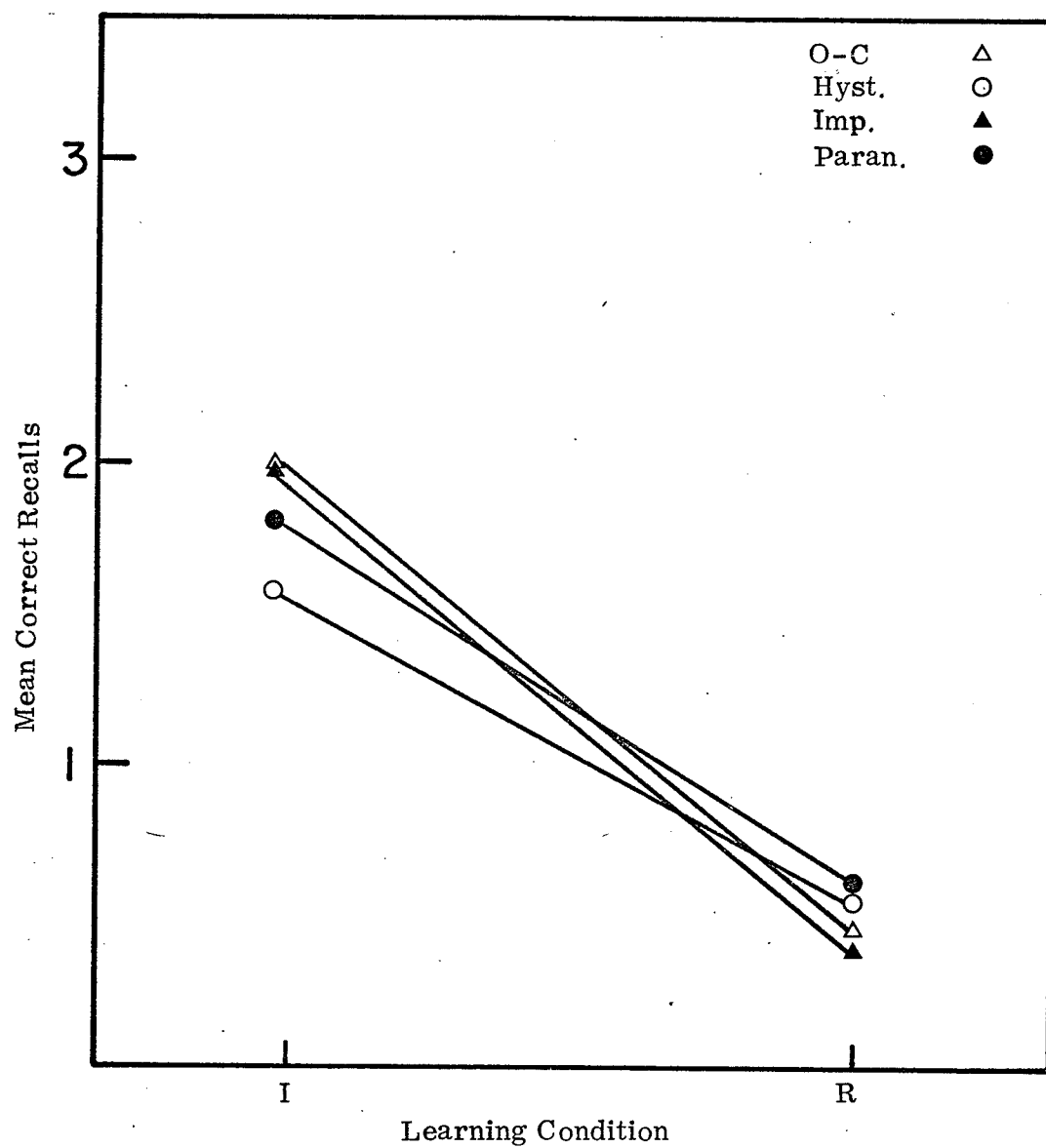


Figure 22. Mean number of correct recalls of concrete picture items as a function of P.R.F. group and learning condition.

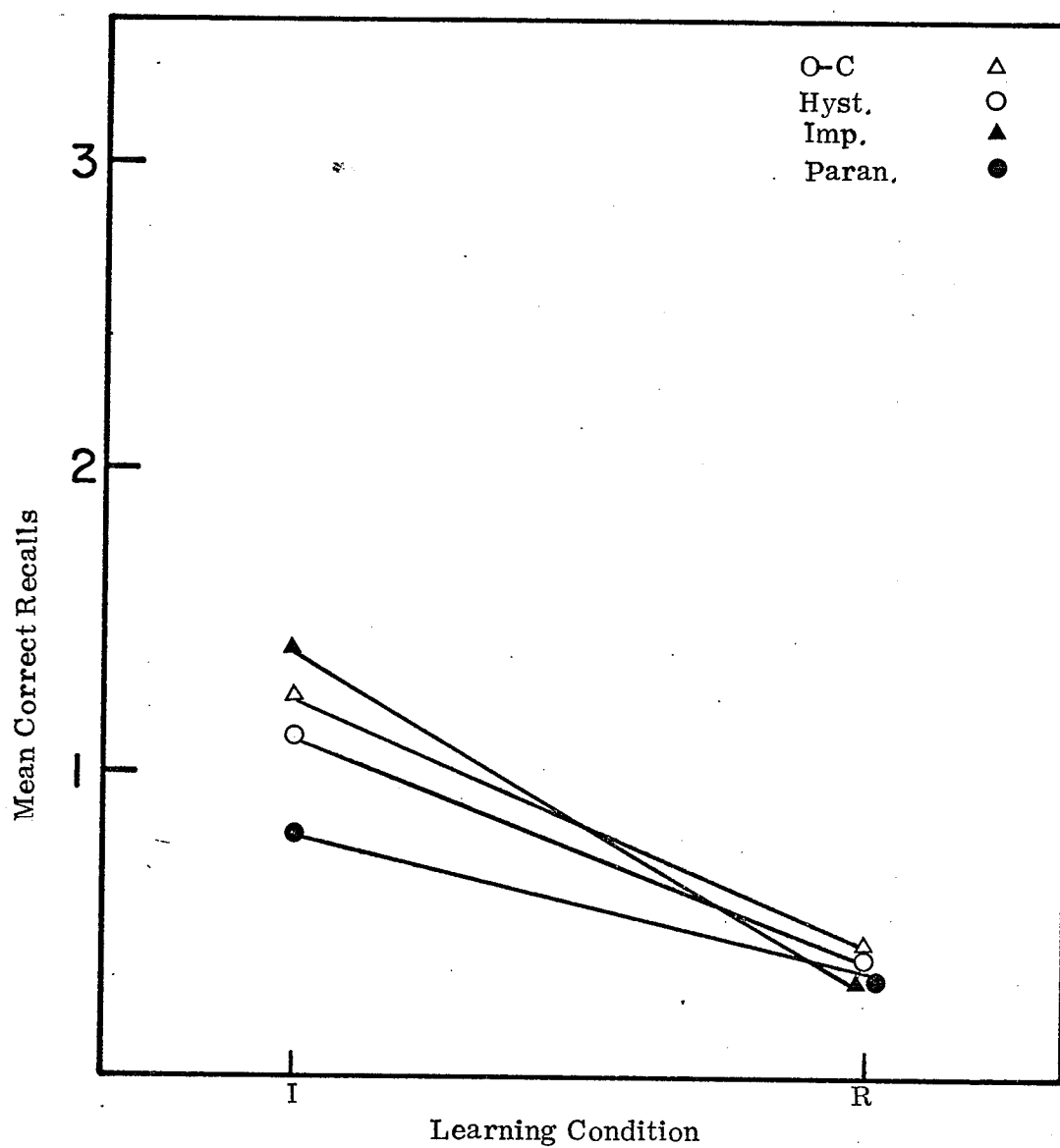


Figure 23. Mean number of correct recalls of abstract word items as a function of P.R.F. group and learning condition.

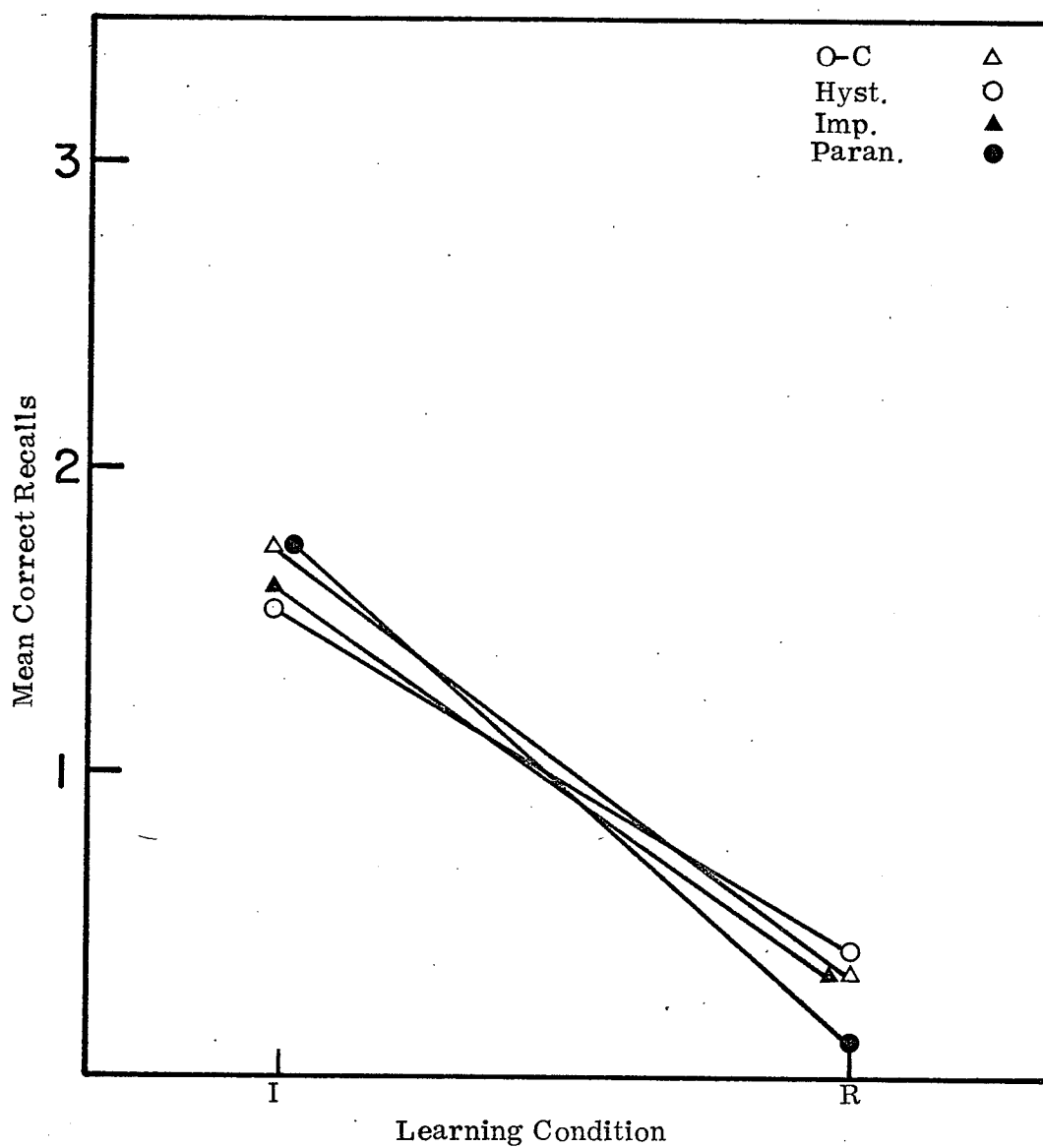


Figure 24. Mean number of correct recalls of concrete word items as a function of P.R. F. group and learning condition.

hysteric 'styles'. Under repetition study, on the other hand, the hysteric 'style' showed the superior performance, followed by the impulsive and obsessive-compulsive 'styles' (who had a tied rank performance) and the paranoid 'style'. Thus it seems that for concrete word items also, the learning condition employed proved an effective predictor of functioning among the 'styles'.

An analysis of Table 2 also provides some rather interesting insight into the functioning of the different 'styles'. As can be seen from Table 2, learning condition in particular was predictive of functioning. Under imagery study a differential functioning was observed across all 'styles' whereas under repetition study this difference was practically absent.

TABLE 2

Mean Number of Items Correctly Recalled as a Function of PRF  
"Style", Learning Condition, and Materials Learned

|                   | O-C   | Hysteric | Impulsive | Paranoid |
|-------------------|-------|----------|-----------|----------|
| <b>Imagery</b>    |       |          |           |          |
| Picture-concrete  | 2.031 | 1.594    | 2.000     | 1.813    |
| Word-concrete     | 1.750 | 1.594    | 1.656     | 1.750    |
| Picture-abstract  | 1.313 | 1.500    | 2.094     | 1.781    |
| Word-abstract     | 1.381 | 1.125    | 1.406     | .813     |
| <b>Repetition</b> |       |          |           |          |
| Picture-concrete  | .469  | .563     | .375      | .594     |
| Word-concrete     | .344  | .375     | .344      | .094     |
| Picture-abstract  | 1.031 | .813     | 1.000     | .656     |
| Word-abstract     | .438  | .406     | .375      | .375     |

(Data Maximum = 4.000)

$p < .01$ .

Under repetition study the typical performance across 'styles' was as follows: the best recall occurred for abstract pictures, followed by concrete pictures, abstract words and concrete words. The only exception to this was the impulsive 'style', whose members recalled an equal number of concrete pictures and abstract words.

Under imagery study, on the other hand, a different characteristic style of functioning was observed for each 'style'. The obsessive-compulsive 'style' showed a greater recall of concrete items over abstract and this seemed to 'carry over' the picture-word dimension. As such, they showed their best recall on concrete pictures followed by concrete words, abstract pictures and abstract words. The hysteric 'style', on the other hand, while showing a greater recall of concrete over abstract items, showed a superiority of pictures over words only when they were abstract. The impulsive 'style' seemed to be more greatly affected by the picture-word dimension rather than the concrete-abstract dimension. While recalling more pictures than words a reversal did occur. They recalled more abstract pictures than concrete pictures whereas they recalled more concrete words than abstract words. Finally, the paranoid 'style' appeared to show a greater recall of pictures over words, even though this interacted with the abstract-concrete dimension. They showed their best performance on concrete pictures, followed by abstract pictures, concrete words and abstract words. Thus it seems that, at least under imagery study, a differential functioning by 'style' according to the type of materials learned was observable.

Another rather important difference in functioning which appeared indicative of a general influence of 'style' occurred between the 'average' and 'high' levels. Whereas for the average level, list (list 1 or list 2)

appeared to be a significant factor ( $F(1, 24) = 21.01, p < .01$ ), it was not significant in the 'high' level ( $F(1, 24) = .56, p > .05$ ). Figure 25 indicates that while recall decreased significantly across lists for the average level, it only decreased slightly for the high level. The results therefore seem to indicate that a factor that is common to all of the 'styles' on either of the levels, may be predictive of differential functioning. A more thorough discussion of this difference in functioning by level is presented in the discussion.

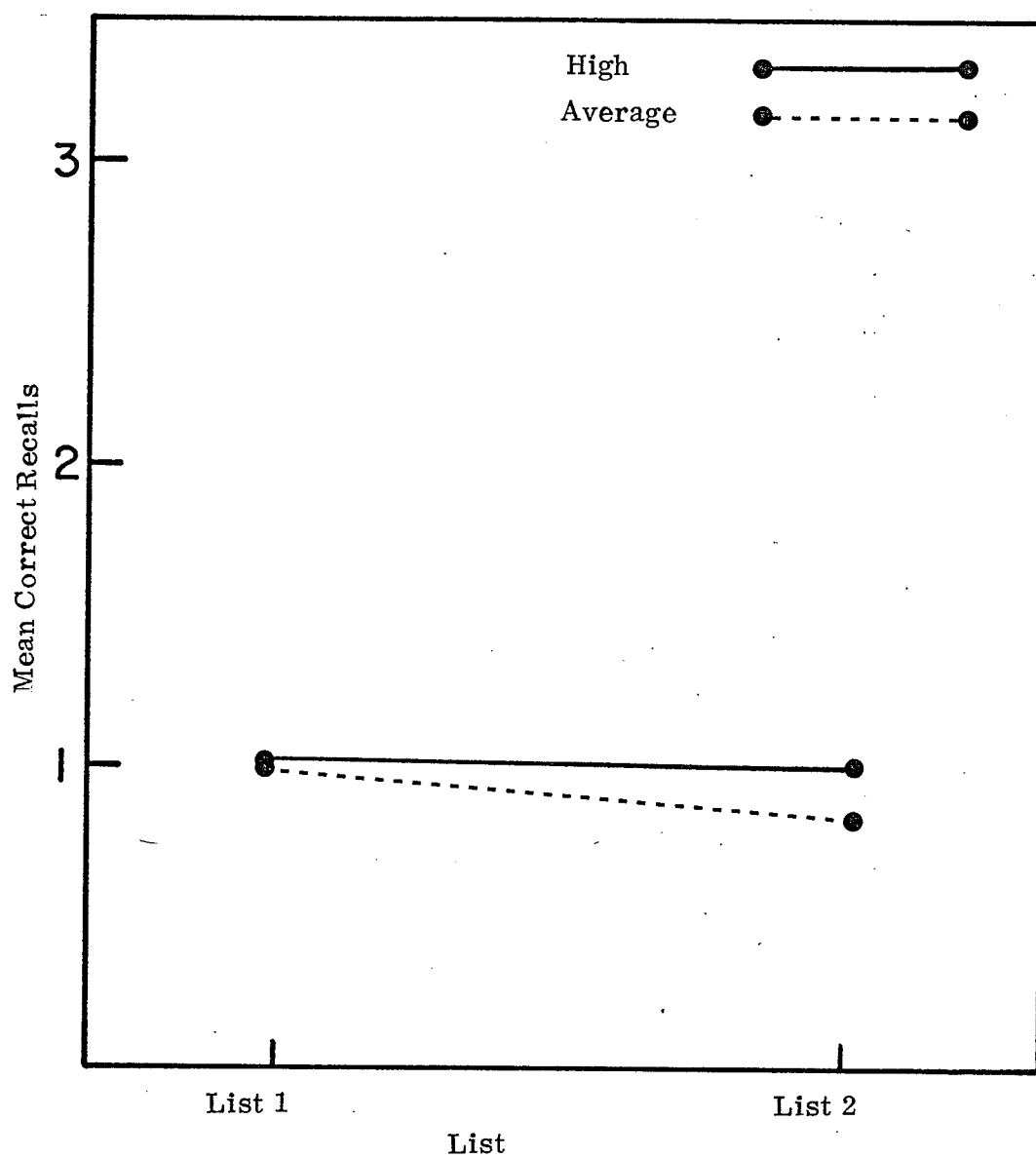


Figure 25. Mean number of correct recalls as a function of list and level (high or average).

## Discussion

As pointed out previously, the rationale underlying the present study derived from Shapiro's (1965) postulation that each of the four basic modes of functioning (obsessive-compulsive, hysteric, impulsive and paranoid) represents a specific 'neurotic style' or mode of cognition which effects perception, learning, memory and, in general, results in characteristic and observable behavioral manifestations. The results of the present study appear to be only partially supportive of this theoretical assertion. Despite the fact that there were no significant overall P.R.F. group differences, significant interactions did occur between the P.R.F. groups and other factors.

It should be emphasized that even though no significant overall group differences were observed, this need not be viewed as positive evidence against the 'existence' of the 'cognitive structures' as posited by Shapiro (1965). One of the major reasons for this statement is the fact that in the present study the sample was drawn from the University of Manitoba student population. Shapiro (1965), on the other hand, had based his descriptions on an identified 'neurotic' sample. As such, the problem is raised regarding the degree of pathology needed before identifiable differences in functioning between the four 'styles' become manifest. It seems logical, as posited earlier, that qualitative differences in functioning may exist between the four 'styles' based on a 'normal' sample. However, it seems also apparent that significant quantitative differences would become manifest only as the pathology became more severe. For this reason, the nature of the sample employed in the present study may have necessarily reduced the probability of obtaining any significant overall group differences.

As such, it is not really surprising that only one interaction between the PRF groups and learning task was indicative of any 'stylistic' differences in functioning. From Figures 21, 22, 23, and 24 it can be seen that a differential functioning between the four 'styles' did occur as a result of learning condition employed and type of learning material. It seems also of interest that the significant differences observed between the 'styles' were only present under the imagery study condition. Under repetition study all four of the 'styles' showed a characteristic performance; they showed a superior recall of the abstract pictures, followed by the concrete pictures, abstract words and concrete words. The only deviation from this consistent pattern was the impulsive "style" which showed a tied performance on the concrete pictures and abstract words. As such, under repetition study the characteristic preference in functioning was for pictures over words and for abstract over concrete items.

Under imagery study a differential functioning on the items learned and recalled was observed for each 'style'. This would seem to be a logical expectation, since it seems probable that imagery study would 'allow for' a greater variation in functioning than would rote repetition. Because learning by rote repetition would appear to be a rather overlearned task, any differences in performance as a result of 'stylistic' characteristics would not become evident. On the other hand, since imagery study would necessarily employ a 'less used' function, which would seem to involve a much more constructive and creative process (the Ss had to form an image), any differences in functioning as a result of 'cognitive style' influences would be expected. It is just this, the fact that imagery study implies an active, constructive encoding and retrieval process (see Neisser, 1967), that gives support to the interpretation of different functional 'cognitive styles' between the groups. As such, the differences

observed under imagery study seem logically attributable to the different 'cognitive styles' involved.

The finding that the obsessive-compulsive 'style' showed a superiority of concrete pictures and words over abstract pictures and words would seem to be in agreement with Shapiro's (1965) conceptualization of the obsessive-compulsive's functioning. The fact that the obsessive-compulsive's cognition is not 'free and mobile' but rather is more 'stimulus bound' and attracted to the 'more immediately manifest or concrete aspect of a situation or task' would seem to be an adequate explanation of the present findings. Because the obsessive-compulsive is characterized by a limitation of attention which prevents him from expressing a free mobility of attention or a flexible cognitive mode, he views the hunch or passing impression as a potential distraction from his typical single-minded concentration. As such, it would seem that any stimulus material that was not 'tied down' to a concrete fact or conception, would be disturbing to him. In conjunction with this, was the finding that under repetition study the obsessive-compulsive's showed a superior recall to the other three 'styles'. This also would seem to be indicative of their (the O-C's) rigidity in functioning. Since repetition study has been posited as being an 'overlearned task' and does not involve the active constructive process that imagery study demands, it would seem logical that the obsessive-compulsive would show a superior performance; because the task is a meticulous one they would seem to function better at it. Thus the obsessive-compulsive's performance for concrete items and his comparatively superior recall to the other three 'styles' under repetition study would seem to be indicative of a 'rigidness' of attention that could be interpreted as supportive of Shapiro (1965).

The findings indicate that the hysteric 'style' also showed a superior recall of concrete over abstract items, however, the superiority of pictures

over words was maintained only for the abstract items. For the concrete items, pictures and words were recalled with equal frequency, whereas for the abstract items there was a superiority of pictures over words. The fact that there was no clear superiority in functioning of pictures over words can be interpreted as providing support for Shapiro's (1965) conceptualization of the hysteric's 'style' of functioning. It seems logical that the hysteric, who is characterized not only by the immediate and impressionistic qualities of his original perceptions, but also by the fact that his original cognition, which is not typified by a sharply defined and technical mode of attention, would not benefit by the ideational qualities of pictures. Because the hysterical individual's responses are not attained through a process of sharp concentration on facts and articulated principles, but are reached by 'hunches', any effect of pictures would seem to be lost. Indeed, since stimulus-term-concreteness is facilitative of imagery production (Paivio, 1967) and in turn total recall, it seems logical to conclude that, for the hysterical 'style', there seems to be an equivalence between pictures and words with regard to capacity to evoke images. In conjunction with this is Shapiro's (1965) postulation that the hysteric is typified by the defense mechanism of repression. If, as Gardner and Long (1961) point out, repression can be likened to the phenomenon of levelling, it seems not at all surprising that words would be recalled as equally well as pictures. The hysteric may have simply 'levelled' any of the extraneous factors associated with the picture, and the picture, therefore, acts functionally in recall as a word.

The results indicate that the impulsive 'style', unlike the obsessive-compulsive and hysteric 'styles' which showed a preference for concrete items, seemed to be effected most by the pictorial qualities of the items.

As such, they showed a superior recall of abstract pictures, followed by concrete pictures, concrete words and abstract words. This finding can also be viewed as supportive of Shapiro's (1965) conceptualization of the impulsive 'style'. Because the impulsive individual experiences an immediate response to situations where his initial impression, hunch, or guess, becomes without much further development, his final conclusion, it would seem logical that he would show a more superior performance on pictures than words. Since the picture items provide a greater array of stimulus materials for the individual to attend to, and since, as Shapiro (1965, p. 150) points out, the impulsives' 'style' of thinking is 'passive' and 'concrete', it would seem logical that the impulsive 'style' would function better with picture items, if for no other reason than the wider array of stimulus cues provided.

The paranoid 'style' also showed a superiority in recall of pictures over words, but unlike the impulsive 'style', the paranoid individuals showed a consistent superiority of concrete over abstract items. This finding also can be seen as being supportive of Shapiro's conceptualization of the paranoid 'style'. Shapiro (1965) points out that the paranoid is not merely capable of remarkably active, intense, and searching attention, but they seem essentially incapable of anything else. As such, their 'cognitive style' is very much like the obsessive-compulsives', the difference being that the paranoid 'style' is extremely biased; the paranoid individual searches repetitively for confirmation of his own anticipations.

It seems logical therefore that the paranoid 'style' would not only attend to and recall more frequently the pictures over words but also the concrete over the abstract items. It would seem that the concrete items would be recalled more frequently because of the acuteness and intensity of attention with which the paranoid individual would approach the task.

Because the paranoid's attention is rigid and exceedingly narrow in its focus, it would seem that such a mode of attention would be able to integrate and process concrete items more effectively. The paranoid may be hindered in his ability to abstract because of his rigidly narrow focus that would tie him to the concrete.

In addition, the superiority of pictures over words seems also explainable in these terms. Since the paranoid is suspicious and since because of his rigidity he cannot tolerate the unexpected, the surprising, or the unusual, he avoids surprise by anticipating. If it can be assumed that the pictures in the experiment constituted a new or surprising learning style for the subject, then the novelty of these items can explain their superior recall. The paranoid 'style' once confronted with a new situation will become 'hyperalert' and bring his full attention to bear on it. As such, this increase in attentive processes applied to the pictures, can account for their superior recall over words.

Thus it seems from the foregoing, that there is an indication of a differential functioning between the P.R.F. groups as a function of differences in cognitive 'styles'. In conjunction with this was the finding that while the 'average' level showed a significant decrease in recall across lists, the 'high' level showed only a slight decrease. This result would seem to indicate that the presence of the 'cognitive structure' that underlies any one of the four 'styles' is conducive to learning and recall in a more or less consistent fashion. On the other hand, the differential performance may be accounted for in terms of a shift in learning strategy from list 1 to list 2. Yuille and Paivio (1967) and Paivio and Yuille (1968) have found that the effects of I and R instructions proved somewhat transient from list to list, inasmuch as the rote repetition group was performing as

well as the mediation group by about the third trial. Their explanation of this phenomenon was simply that S's do not in fact consistently follow instructional sets if the suggested strategies are inefficient for the type of material being learned. In other words, the S, having become experienced with the different learning strategies, soon resorts to the method which is not only the easiest but which results in greater recall. This method is I. Thus, by list 2 the S is employing imagery techniques in both the I and R conditions. The advantages accrued to the possession of a 'cognitive style' therefore, may be only a function of being more willing to abandon instructions.

Interestingly enough, sex appeared to be a major differentiating factor between the P.R.F. groups investigated. As was observed in Figure 4, the females displayed a greater variability of functioning across all groups than did their male counterparts who showed a considerable homogeneity of functioning regardless of their P.R.F. group membership. As such, a reversal in functioning was observed in which the females of the obsessive-compulsive and impulsive groups outperformed their male counterparts, while the males of the hysteric and paranoid groups outperformed their female counterparts. In conjunction with this finding was the indication that a further opposition of performance existed between the sexes even within each P.R.F. group. In those groups in which the females displayed superior performance, the males showed their poorest performance; whereas, the groups in which the males displayed superior performance, the females showed their poorest performance. It therefore would seem that the specific deficits in performance involved in the functioning of each group were not operative to the same degree in both sexes.

The suggestion of the existence of sex differences in the overall

P.R.F. groups is in agreement with Shapiro's (1965) formulation. He points out that sex differences could be a result of innate factors which can only be responsible for form tendencies of a very general and not a highly differentiated or specific kind. He accounts for the fact that there is an overwhelming predominance of women among hysterical patients, whereas there is a relative predominance of men among obsessive-compulsives in terms of innate structural differences in mode of activity and cognitive attitudes. However, a more plausible explanation seems possible. In addition to the direct effect that sex may have had on the development of a particular trait, is the possibility of an indirect influence in the present study whereby a misclassification into groups may have occurred. Because the P.R.F. is based on trait descriptions which are applied uniformly to both sexes, and since it seems logical that there 'exists' a sex bias towards the development of particular trait characteristics, some contradiction seems apparent. The trait descriptions of any one P.R.F. group may not be as equally applicable to both sexes and therefore may provide a 'better fit' with regard to the functioning of one sex over the other. The fact that the results indicate that males outperformed females in the hysteric group would tend to support this assertion. Since the trait descriptions of hysteria employed by the P.R.F. may be more descriptive of female functioning, it seems logical that there would result a greater misclassification of males into the hysteric group. As such, the males would not exhibit the same deficit in an 'ability to attend' as their female counterparts, and this would be indicated in their superior performance. In any event, more research into this problem is necessary. If there are sex differences within each P.R.F. group, investigation should be directed towards discovering whether these are real differences in functioning as a result of cognitive factors, or merely an artifact

of the classification system.

Thus, it seems from the foregoing, that the results are at least partially supportive of Shapiro's (1965) conceptualization of the neurotic 'styles'. As pointed out, probably the main limitation of the present study was the ability to arrive at only a suggestion of any qualitative description of the four 'styles' investigated. Since the analysis was based on a quantitative distinction across groups, it could be logically concluded that the nature of the sample ('normals') placed inherent restrictions on the scope of the study. It seems a safe assumption that, had a 'neurotic' sample been employed, the quantitative differences, in all probability, would have become manifest. As such, further research into the problem should either make use of a more 'pathological' sample (in order that the quantitative differences would be accentuated) or a more sensitive learning task (in order that the qualitative differences would be revealed). Gardner and Moriarty (1968) have illustrated some of these more sensitive methods in an excellent summary of the research into cognitive control structures. It seems logical that these measures can be extended into the verbal learning and memory area of research.

Another problem which also must be considered in further research of this type concerns the validity of the 'stylistic' descriptions that Shapiro (1965) posits. Because his categorization of 'styles' is based mainly on clinical evidence and inference there exists the problem of objectively defining and measuring the phenomena which he describes. It seems logical that once a means of objectively defining the 'styles' in measurable terms is formulated, not only will the operational validity but also the reliability of the 'styles' will be increased. This would, in turn, result in a more valid representation of the different 'styles' and ensure the greater probability of experimental replication. In this way it would be possible to

pursue research on the cognitive 'styles' in a more meaningful way.

Dependent Factors:

The finding that imagery study resulted in a greater recall of items than did repetition study replicates the results of other investigators who have employed both between-subject designs, (Paivio and Yuille, 1967, 1969) and within-subject designs, as well as immediate and delayed retention (Schnorr and Atkinson, 1969; Yarmey and Barker, 1971). Further, in the present study this facilitation of learning under imagery study for word pairs has been extended to pictures. It is evident that S's are able to alternate use of two strategies during the presentations of a single list that is composed of two different types of stimulus materials (pictures and words).

One possible implication of the fact that concreteness results in superior retention and thus imagery instructions result in superior repetition to rote repetition instructions has been pointed out by Paivio and Madigan (1968). They emphasized that one of the more important theoretical contributions of the imagery hypothesis is that it implied a multistage coding process (cf. McGuire, 1961) in which stimulus and response terms are encoded into nonverbal images during their paired presentation. On the recall trials the stimulus term would presumably act as a cue for the compound image, which could be decoded to yield the appropriate verbal response. They further made the point that there is evidence that Ss are able to use coding devices of varying complexity (Keiss and Montague, 1965), thus inferring varying complexities at the storage level. This finding was supported by Yarmey and Barker (1971).

The superiority in retention of pictures over words is in agreement with previous studies (e.g., Paivio and Yarmey, 1966; Yarmey and Barker,

1971). It seems logical that since pictures arouse concrete imagery directly, such items should be superior even to high imagery nouns a 'conceptual pegs' (see Paivio, 1963, 1965) in paired-associate learning. In addition, Wimer and Lambert (1959) demonstrated that the faster learning of objects as opposed to words was not due to their greater meaningfulness but was due to the 'presence of less intralist generalization in the object lists.

In conjunction with the above was the finding that concrete items showed a superiority in recall over abstract items in delayed retention. This would be an expected outcome if as Paivio (1965) points out that the superiority of concrete items lies in their ability to evoke imagery and thus act as conceptual pegs, were true. As such they would be more easily retrievable. The fact that these differences were not significant in immediate recall lends support to this conclusion; it appears that the deficit in memory is a function of labelling or decoding at retrieval rather than storage.

A further understanding of the processes operative during learning by I can be obtained from an investigation of the effects of learning condition over memory. Here it is shown that not only does I have its greatest effect in immediate recall but also the greatest loss of items from immediate to delayed memory occurs in the I items. Thus, even though I was superior to R in both memory conditions, the I items showed a greater deterioration than the R items when the amount of forgetting from week 1 to week 2 is viewed. It seems, therefore, safe to conclude that I study shows a much more temporary effect on learning and recall than does R study. An explanation for this finding can be derived from the Atkinson-Shiffrin (1963) multi-stage memory model where immediate recall is viewed as involving a memory store which is to a great extent perceptual, and in which a trace with either auditory or verbal

components decays fairly rapidly in the absence of rehearsal. Assuming that I learning involves more perceptual mental activity than does R study, and given the elimination of rehearsal across memory, the results can therefore be viewed as a natural product of the functioning of the immediate memory store; I items will naturally deteriorate more quickly than R items because of their failure to be transferred into a long term memo transfer is specific to the lack of rehearsal and large perceptual component particular to I items.

Thus it appears that many of the results from the present study are in agreement with evidence from the verbal learning literature. As such, the findings can be applied in a meaningful way in an attempt to describe the processes involved in learning and retention. It seems, however, that an even more meaningful interpretation can be derived if the personality effects on learning can also be included in the model. For this reason, an analysis of the factors involved in attention and retrieval as a function of personality factors seems a relevant area of research. It seems logical that since adequate models of learning and retention are available (e.g., Shiffrin-Atkinson, 1968) an investigation of the individual differences inherent in functioning merits pursuit, and indeed, is a logical step in the progressive understanding of human learning and memory.

## REFERENCES

- Atkinson, R. C. & Shiffrin, R. N., Human memory: A proposed system and its control processes. In K. W. Spence and J. T. Spence (Eds.) *The Psychology of Learning and Motivation: Advances in research and theory*. vol. 2 New York: Academic Press, 1968 pp. 89-195.
- Bartlett, F. C. *Remembering: A study in experimental and social psychology*. Cambridge, England: Cambridge University Press, 1932.
- Bowers, H. Memory and Mental Imagery. An Experimental Study. *Brit. J. Psychol.*, 1931, 21, 271-282.
- Bulgelski, B. R., Kidd, E., & Simpson, J. Image as a mediator in one trial paired associate learning. *J. of Exp. Psych.*, 1968, 76, pp.69-73.
- Dallet, K. M. Implicit mediators in paired associate learning. *J. verbal Learn. verbal Beh.*, 1964, 3, 209-214.
- Davis, A. J. A methodological and developmental investigation of Sigel's cognitive style test. *Dissertation Abstracts International*, 1970, 30(7-B) 3400-3401.
- Dukes, W. F. & Bastian, J. Recall of abstract and concrete words equated on meaningfulness. *J. verb. Learn. verb. Behav.*, 1966, 5, 455-458.
- Erikson, E. H. *Childhood and society*. New York: Norton, 1950.
- Erikson, E. H. The problem of ego identity. *J. Amer. Psychia. Assoc.* 1956, 4, 56-121.
- Eysenck, H. J. *Perceptual processes and mental illness*. New York: Basic Books, 1957.
- Gardner, R. W. Cognitive styles in categorizing behavior. *J. of Personality*, 1953, 22, 214-233.
- Gardner, R. W. Cognitive control principles and perceptual behavior. *Bull Menninger Clin.*, 1959, 23, 241-248.
- Gardner, R., Holzman, P.S., Klein, G. S., Linton, H. & Spence, D. P. Cognitive control: a study of individual consistencies in cognitive behavior. *Psych. Issues*, 1 Whole No.4, 1959.
- Gardner, R. W., Jackson, D. N., & Messick, S. J. Personality organization in cognitive controls and intellectual abilities. *Psychology Issues*. 1960, 2 (4) monograph 8.
- Gardner, R. W. & Long, R. I. The stability of cognitive controls. *J. Abn. Soc. Psych.* 1961, 21, 102-117.
- Hartmann, H. Psychoanalysis and the concept of health. *Int. J. of Psychanal.* 1939(b), 20, 303-321.
- Hartmann, H. & Loevenstein, R. M. Comments on the formation of psychic structure. *The psychoanalytic study of the child*. 2:11-38 New York: International Universities Press, 1946.
- Hartmann, H. Comments on the psychoanalytic theory of the ego. *The psychoanalytic study of the child*. 5,74-96. New York: International Universities Oress, 1950.

- Hartmann, H. Ego psychology and the problem of adaptation. New York: International Universities Press, 1958.
- Holt, R.R. Motives and thought: psychoanalytic essays in honor of David Rappaport. Psych. Psych. Issues 1966, 5(2-3) (monograph 18/19).
- Holzman, P. S. Repression and cognitive style. In Festschrift for Gardner Murphy. ed. J. G. Peatman and E. L. Hartley. New York: Harper, 1960.
- Hunter, I. M. L. Memory. Harmondsworth: Penguin, 1964.
- Jackson, D. N. Personality Research Form. (Form AA) Research Psychologists Press, Inc., 1967. Goshen, New York.
- Jackson, D. N. & Messick, S. J. Content and style in personality assessment. Psych. Bull. 1958, 55, 243-252.
- Jenkins, J. J. Meaningfulness and concepts: Concepts and meaningfulness. In H. J. Klausmeir & C. W. Harris (Eds.) Analysis of concept learning. 65-79.
- Kagan, J., Moss, H. A. & Sigel, I. E. Conceptual style and the use of affect labels. Merrill-Palmer Quarterly, 1961, 7, 261-278.
- Kagan, J., Moss, H. A. & Sigel, I. E. Psychological significance of styles of conceptualization. Merrill-Palmer Quarterly, 1964, 10, 73-112.
- Kaplan, S., Kaplan, R., & Sampson, J. R. Encoding and arousal factors in free recall of verbal and visual material. Psych. Sci., 1968, 12 (2) 73-74.
- Keiss, H. O., & Montague, W. E. Natural language mediators in paired associate learning. Psych. Sci., 1965, 3, 549-550.
- Klein, G. S. The personal world through perception, in R. R. Blake & G. V. Ramsey (eds.) Perception: an approach to personality. New York: Ronald 1951.
- Klein, G. S. Need and Regulation, in Nebraska Symposium on Motivation. Marshall R. Jones (ed.) Lincoln: Univ. of Nebraska Press, 1954.
- Klein, G. S. Perception, Motives, and personality: a clinical perspective. In Psychology of personality: sex modern approaches ed. J. McCary. New York, Logos Press, 1956.
- Klein, G. S., Spence, D. P., Holt, R. R. & Gowrevitch, S. Cognition without awareness: 1. Subliminal influences upon conscious thought. J. Abn. Soc. Psych. 1958, 57, 255-266.
- Klein, G. S. "Cognitive control and motivation" in Assessment of Motives, Gardner Lindzey (ed.) New York: Rinehart, 1959.
- Lieberman, L. R., & Culpepper, J. T. Words vs. objects: Comparison of free verbal recall. Psych. Rep., 1965, 17, (3) 983-988.
- McGuire, W. J. A multiprocess model for paired associate learning. J. Exp. Psych., 1961, 62, 335-347.
- Menninger, K. (with Martin Mayman, and Paul Pryser) The vital balance. New York: the Viking Press, 1963.

- Miller, G. A., Galanter, E., & Pribram, K. H. Plans and the structure of behavior. New York: Holt, 1960.
- Mowrer, O. H. Learning theory and the symbolic processes. New York: Wiley, 1960.
- Neisser, U. Cognitive psychology. New York: Appleton Century Crofts, 1967.
- Noble, C. E. An analysis of meaning. Psychol. Rev., 1952, 59, 421-430.
- Paivio, A. Abstractness, imagery and meaningfulness in paired-associate learning. J. verbal Learn. verbal Beh., 1965, 4, 32-38.
- Paivio, A. Paired-associate learning and free recall of nouns as a function of concreteness, specificity, imagery, and meaningfulness. Psych. Rep., 1967, 20, 239-245.
- Paivio, A. A factor analytic study of word attributes and verbal learning. J. verbal Learn. verbal Beh., 1968, 7, 41-49.
- Paivio, A., & Madigan, S. A. Imagery and association value in paired-associate learning. J. exp. Psychol., in press.
- Paivio, A., & Steeves. The relations between personal values and the imagery and meaningfulness of value words. Percept. Mot. Skills, in press.
- Paivio, A., & Yarmey, A. D. Abstractness of the common element in mediated learning. Psychon. Sci., 1965, 2, 231-232.
- Paivio, A., & Yarmey, A. D. Pictures versus words as stimuli and responses in P.A. learning. Psych. Sci., 1966, 5, 235-236.
- Paivio, A. & Yuille, J. C. Mediation instructions and word attributes in P.A. learning. Psych. Sci., 1967, 8, 65-66.
- Paivio, A., Yuille, J. C. & Madigan, S. Concreteness, imagery and meaningfulness values for 925 nouns. J. Exp. Psych., 1968, 76, 69-73.
- Paivio, A., Yuille, J. C., & Smythe, P. C. Stimulus and response abstractness, imagery, and meaningfulness, and reported mediators in paired-associate learning. Canad. J. Psychol., 1966, 20, 362-377.
- Paul, J. H. Studies in remembering. Psych. Issues. 1959, 1(2) Monograph 2.
- Postman, L., & Conger, B. Verbal habits and the visual recognition of words. Science, 1954, 119, 671-673.
- Rapaport, D. Emotions and memory, 2nd ed. New York: International Universities Press, 1950.
- Rapaport, D. The structure of psychoanalytic theory. Psych. Issues, 1960, 2(2) Monograph 6.
- Rapaport, D. Cognitive structures, in Contemporary approaches to cognition. A symposium held at the Univ. of Colorado, Harvard Univ. Press. Cambridge, 1964.
- Reese, H. W. Imagery in P.A. learning in children. J. Exp. Child Psych. 1965, 2, 290-296.
- Reich, W. Character analysis, (1933). New York: Orgone Institute Press, 1949.

- Reich, W. The function of the orgasm. New York: Orgnone Institute Press, 1942.
- Runquist, W. N., & Farley, F. H. The use of mediators in the learning of verbal P.A.'s. J. verbal Learn. verbal Beh., 1964, 3, 280-285.
- Schactel, E. G. Matamorphosis. New York: Basic Books, 1959.
- Schnorr, J. A., & Atkinson, R. C. Repetition versus imagery instructions in the short and long term retention of P.A.'s. Psych. Sci., 1969, 15 (4) 183-184.
- Shapiro, D. Neurotic Styles. New York: Basic Books, 1965.
- Skinner, B. F. Verbal behavior. New York: Appleton-Century-Crofts, 1957.
- Smith, M. G., & Harleston, B. W. Stimulus abstractness and emotionality as determinants of behavioral and physiological responses in a word-association task. J. verb. Learn. verb. Behav., 1966, 5, 309-313.
- Smith, R. K., & Noble, C. E. Effects of amnemonic technique applied to verbal learning and memory. Percept. mot. Skills, 1965, 21, 123-134.
- Spiker, C. C. Associative transfer in verbal P.A. learning. Child Dev., 1960, 31, 73-87.
- Staats, A. W. Verbal habit families, concepts, and the operant conditioning of word classes. Psychol. Rev., 1961, 68, 190-204.
- Staats, A. W., & Staats, C. K. Meaning and m: correlated but separate. Psychol. Rev., 1959, 66, 136-144.
- Tulving, E. The effect of alphabetical subjective organization on memorizing unrelated words. Can. J. Psych., 1962, 16, (3), 185-191.
- Tulving, E. Subjective organization in free recall of unrelated words. Psych. Rev. 1962, 69, 344-354.
- Underwood, B. J., & Schulz, R. W. Meaningfulness and verbal learning. Chicago: Lippincott, 1960.
- Wallace, W. H., & Turner, S. H., & Perkins, C. C. Preliminary studies of human information storage. Signal Corps Project No. 1320, 1957, U. of Penn., Instit. for Coop. Research.
- Waly, P., & Cook, S. W. Attitude as a determinant of learning and memory: a failure to confirm. J. of Pers. and Soc. Psych., 1966, 4, 280-288.
- Winnick, W. A., & Kressel, K. Tachistoscopic recognition thresholds, paired-associate learning, and immediate recall as a function of abstractness-concreteness and word frequency. J. exp. Psychol., 1965, 70, 163-168.
- Wimer, C. C., & Lambert, W. E. The differential effects of word and object stimuli on the learning of P.A.'s. J. Exp. Psych., 1959, 57, 31-36.
- Yarmey, A. D., & Paivio, A. Further evidence on the effects of word abstractness and meaningfulness in paired-associate learning. Psychon. Sci., 1965, 2, 307-308.

- Yarmey, A. D., & Barker, W. J. Repetition versus imagery instructions in the short and long term retention of picture and word paired associates. *Can. J. of Psych.*, 1971, 25(1), 56-61.
- Yntema, D. B., & Trask, F. P. Recall as a search process. *J. of verb. learning and verb. behav.*, 1963, 2, 65-74.
- Yuille, J. C., & Paivio, A. Latency of imaginal and verbal mediators as a function of stimulus-response concreteness and imagery. *J. Exper. Psych.*, 1967, 75, 540-544.
- Yuille, J. C., & Paivio, A. Imagery and verbal mediation instructions in P.A. learning. *J. Exp. Psych.*, 1968, 78, 436-441.

## APPENDIX 1

## PERSONALITY RESEARCH FORM SCALES

| <u>SCALE</u>               | <u>DESCRIPTION OF HIGH SCORER</u>                                                                                                                                                                       | <u>DEFINING TRAIT ADJECTIVES</u>                                                                                                                                                                          |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Abasement</b>           | Shows a high degree of humility; accepts blame and criticism even when not deserved; exposes himself to situations where he is in an inferior position; tends to be self-effacing.                      | meek, self-accusing, self-blaming, obsequious, self-belittling, surrendering, resigned, self-critical, humble, apologizing, subservient, obedient, yielding, deferential, self-subordinating.             |
| <b>Achievement</b>         | Aspires to accomplish difficult tasks; maintains high standards and is willing to work toward distant goals; responds positively to competition; willing to put forth effort to attain excellence.      | striving, accomplishing, capable, purposeful, attaining, industrious, achieving, aspiring, enterprising, self-improving, productive, driving, ambitious, resourceful, competitive.                        |
| <b>Affiliation</b>         | Enjoys being with friends and people in general; accepts people readily; makes efforts to win friendships and maintain associations with people.                                                        | neighborly, loyal, warm, amicable, good-natured, friendly, companionable, genial, affable, cooperative, gregarious, hospitable, sociable, affiliative, good-willed.                                       |
| <b>Aggression</b>          | Enjoys combat and argument; easily annoyed; sometimes willing to hurt people to get his way; may seek to "get even" with people whom he perceives as having harmed him.                                 | aggressive, quarrelsome, irritable, argumentative, threatening, attacking, antagonistic, pushy, hot-tempered, easily-angered, hostile, revengeful, belligerent, blunt, retaliative.                       |
| <b>Autonomy</b>            | Tries to break away from restraints, confinement, or restrictions of any kind; enjoys being unattached, free, not tied to people, places, or obligations; may be rebellious when faced with restraints. | unmanageable, free, self-reliant, independent, autonomous, rebellious, unconstrained, individualistic, ungovernable, self-determined, non-conforming, uncompliant, undominated, resistant, lone-wolf.     |
| <b>Change</b>              | Likes new and different experiences; dislikes routine and avoids it; may readily change opinions or values in different circumstances; adapts readily to changes in environment.                        | inconsistent, fickle, flexible, unpredictable, wavering, mutable, adaptable, changeable, irregular, variable, capricious, innovative, flighty, vacillating, inconstant.                                   |
| <b>Cognitive Structure</b> | Does not like ambiguity or uncertainty in information; wants all questions answered completely; desires to make decisions based upon definite knowledge, rather than upon guesses or probabilities.     | precise, exacting, definite, seeks certainty, meticulous, perfectionistic, clarifying, explicit, accurate, rigorous, literal, avoids ambiguity, defining, rigid, needs structure.                         |
| <b>Defendence</b>          | Readily suspects that people mean him harm or are against him; ready to defend himself at all times; takes offense easily; does not accept criticism readily.                                           | self-protective, justifying, denying, defensive, self-condoning, suspicious, secretive, has a "chip on the shoulder," resists inquiries, protesting, wary, self-excusing, rationalizing, guarded, touchy. |
| <b>Dominance</b>           | Attempts to control his environment, and to influence or direct other people; expresses opinions forcefully; enjoys the role of leader and may assume it spontaneously.                                 | governing, controlling, commanding, domineering, influential, persuasive, forceful, ascendant, leading, directing, dominant, assertive, authoritative, powerful, supervising.                             |
| <b>Endurance</b>           | Willing to work long hours; doesn't give up quickly on a problem; persevering, even in the face of great difficulty; patient and unrelenting in his work habits.                                        | persistent, determined, steadfast, enduring, unfaltering, persevering, unremitting, relentless, tireless, dogged, energetic, has stamina, sturdy, zealous, durable.                                       |
| <b>Exhibition</b>          | Wants to be the center of attention; enjoys having an audience; engages in behavior which wins the notice of others; may enjoy being dramatic or witty.                                                 | colorful, entertaining, unusual, spellbinding, exhibitionistic, conspicuous, noticeable, expressive, ostentatious, immodest, demonstrative, flashy, dramatic, pretentious, showy.                         |

|                    |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                          |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| harm avoidance     | Does not enjoy exciting activities, especially if danger is involved; avoids risk of bodily harm; seeks to maximize personal safety.                                                                                                                          | fearful, withdraws from danger, self-protecting, pain-avoidant, careful, cautious, seeks safety, timorous, apprehensive, precautionary, unadventurous, avoids risks, attentive to danger, stays out of harm's way, vigilant.                             |
| impulsivity        | Tends to act on the "spur of the moment" and without deliberation; gives vent readily to feelings and wishes; speaks freely; may be volatile in emotional expression.                                                                                         | hasty, rash, uninhibited, spontaneous, reckless, irrepressible, quick-thinking, mercurial, impatient, incautious, hurried, impulsive, foolhardy, excitable, impetuous.                                                                                   |
| nurturance         | Gives sympathy and comfort; assists others whenever possible, interested in caring for children, the disabled, or the infirm; offers a "helping hand" to those in need; readily performs favors for others.                                                   | sympathetic, paternal, helpful, benevolent, encouraging, caring, protective, comforting, maternal, supporting, aiding, ministering, consoling, charitable, assisting.                                                                                    |
| order              | Concerned with keeping personal effects and surroundings neat and organized; dislikes clutter, confusion, lack of organization; interested in developing methods for keeping materials methodically organized.                                                | neat, organized, tidy, systematic, well-ordered, disciplined, prompt, consistent, orderly, clean, methodical, scheduled, planful, unvarying, deliberate.                                                                                                 |
| play               | Does many things "just for fun;" spends a good deal of time participating in games, sports, social activities, and other amusements; enjoys jokes and funny stories; maintains a light-hearted, easy-going attitude toward life.                              | playful, jovial, jolly, pleasure-seeking, merry, laughter-loving, joking, frivolous, prankish, sportive, mirthful, fun-loving, gleeful, care-free, blithe.                                                                                               |
| sensitiveness      | Notices smells, sounds, sights, tastes, and the way things feel; remembers these sensations and believes that they are an important part of life; is sensitive to many forms of experience; may maintain an essentially hedonistic or aesthetic view of life. | aesthetic, enjoys physical sensations, observant, earthy, aware, notices environment, feeling, sensitive, sensuous, open to experience, perceptive, responsive, noticing, discriminating, alive to impressions.                                          |
| social Recognition | Desires to be held in high esteem by acquaintances; concerned about reputation and what other people think of him; works for the approval and recognition of others.                                                                                          | approval seeking, proper, well-behaved, seeks recognition, courteous, makes good impression, seeks respectability, accommodating, socially proper, seeks admiration, obliging, agreeable, socially sensitive, desirous of credit, behaves appropriately. |
| dependence         | Frequently seeks the sympathy, protection, love, advice, and reassurance of other people; may feel insecure or helpless without such support; confides difficulties readily to a receptive person.                                                            | trusting, ingratiating, dependent, entreating, appealing for help, seeks support, wants advice, helpless, confiding, needs protection, requesting, craves affection, pleading, help-seeking, defenseless.                                                |
| understanding      | Wants to understand many areas of knowledge; values synthesis of ideas, verifiable generalization, logical thought, particularly when directed at satisfying intellectual curiosity.                                                                          | inquiring, curious, analytical, exploring, intellectual, reflective, incisive, investigative, probing, logical, scrutinizing, theoretical, astute, rational, inquisitive.                                                                                |
| desirability       | Describes self in terms judged as desirable; consciously or unconsciously, accurately or inaccurately, presents favorable picture of self in responses to personality statements.                                                                             |                                                                                                                                                                                                                                                          |
| frequency          | Responds in implausible or pseudo-random manner, possibly due to carelessness, poor comprehension, passive non-compliance, confusion, or gross deviation.                                                                                                     |                                                                                                                                                                                                                                                          |

## APPENDIX 2

## APPENDIX 2

- A. Measures of Impulse Expression and Control  
    Impulsivity  
    Change  
    

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    Harmavoidance  
    Order  
    Cognitive Structure
- B. Measures of Orientation toward Work and Play  
    Achievement  
    Endurance  
    

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    Play
- C. Measures of Orientation towards Direction from Other People  
    Succorance  
    

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    Autonomy
- D. Measures of Intellectual and Aesthetic Orientations  
    Understanding  
    Sentience
- E. Measures of Degree of Ascendancy  
    Dominance  
    

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    Abasement
- F. Measures of Degree and Quality of Interpersonal Orientation  
    Affiliation  
    Nurturance  
    Exhibition  
    Social Recognition  
    

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    Aggression  
    Defendence
- G. Measures of Test-Taking Attitudes and Validity  
    Desirability  
    Infrequency

### APPENDIX 3

## APPENDIX 3A

## Presentation List 1

| List                        | Type <sup>1</sup> | Learning Condition |
|-----------------------------|-------------------|--------------------|
| arrow - dress               | PC                |                    |
| dream - graduation          | PA                |                    |
| saloon - meadow             | WC                | Imagery            |
| anger - chaos               | WA                |                    |
| church - fork               | PC                |                    |
| research - truce            | PA                | Repetition         |
| lawn - fur                  | WC                |                    |
| charm - intimate            | WA                |                    |
| book - umbrella             | PC                |                    |
| courtship - reflection      | PA                | Imagery            |
| palace - forest             | WC                |                    |
| exhaustion - grief          | WA                |                    |
| apple - pipe                | PC                |                    |
| present - prayer            | PA                | Repetition         |
| prairie - diamond           | WC                |                    |
| crime - happiness           | WA                |                    |
| arm - house                 | PC                |                    |
| passion - goddess           | PA                | Imagery            |
| city - glacier              | WC                |                    |
| joke - pep                  | WA                |                    |
| tree - iron                 | PC                |                    |
| marriage - ghost            | PA                | Repetition         |
| skillet - hurricane         | WC                |                    |
| disaster - jealousy         | WA                |                    |
| cat - beaver                | PC                |                    |
| love - devil                | PA                | Imagery            |
| wheat - steam               | WC                |                    |
| cleanness - comradeship     | WA                |                    |
| claw - pencil               | PC                |                    |
| centennial - multiplication | PA                | Repetition         |
| storm - cotton              | WC                |                    |
| delirium - homicide         | WA                |                    |

<sup>1</sup>P = picture    W = word    C = concrete    A = abstract

## APPENDIX 3B

## Presentation List 2

| List                   | Type <sup>1</sup> | Learning Condition |
|------------------------|-------------------|--------------------|
| star - clock           | PC                |                    |
| engagement - hierarchy | PA                |                    |
| nursery - oven         | WC                | Imagery            |
| panic - genius         | WA                |                    |
| flower - cane          | PC                |                    |
| joy - death            | PA                |                    |
| ink - kiss             | WC                | Repetition         |
| phantom - glory        | WA                |                    |
| snake - door           | PC                |                    |
| drama - vacuum         | PA                | Imagery            |
| shore - pudding        | WC                |                    |
| affection - joviality  | WA                |                    |
| hammer - fireplace     | PC                | Repetition         |
| poverty - exhaustion   | PA                |                    |
| toy - sunset           | WC                |                    |
| competition - kindness | WA                |                    |
| kettle - flag          | PC                |                    |
| destruction - blessing | PA                | Imagery            |
| beggar - home          | WC                |                    |
| spree - power          | WA                |                    |
| ship - tablespoon      | PC                |                    |
| comedy - agony         | PA                | Repetition         |
| mast - plant           | WC                |                    |
| warmth - strength      | WA                |                    |
| coin - bullet          | PC                |                    |
| bravery - victory      | PA                | Imagery            |
| alcohol - army         | WC                |                    |
| rendezvous - misery    | WA                |                    |
| whale - barrel         | PC                |                    |
| nymph - emergency      | PA                | Repetition         |
| market - admiral       | WC                |                    |
| heroism - exertion     | WA                |                    |

<sup>1</sup> P = picture      W = word      C = concrete      A = abstract

## APPENDIX 4

The following is an experiment involved in the recall of both word and picture paired associates. The main purpose of this experiment is to investigate the interaction of materials to be learned and learning conditions, and to observe their effects on the retention of the material. It is a simple memory task which I hope will throw some light on different retention values and has in no way anything to do with your intelligence or personality.

In the following you will learn 2 lists each comprised of picture and word paired associates. For each pair placed by the I marker your task is to create a mental image in which the two items are interacting and to describe the image to me. You will be allowed 8 secs. to do this. For each pair placed by the R marker you are to repeat the pair slowly four times and to refrain from using either verbal or imaginal mediation. You will be allowed 8 secs. to repeat the pair four times. It is imperative that you follow these instructions carefully and employ only the learning strategy that is indicated to you.

If you have any questions please ask them now, as no interruptions will be allowed once the experiment is in progress.

## APPENDIX 5

### Raw Data of Overall Analysis

## MIXED FACTORIAL DESIGNS PROGRAM BY F. CHEBIS

PRF DATA BILL BARKER FEB 13, 1972

## 3 INDEPENDENT FACTORS -

PRF AT 4 LEVELS  
 LEV AT 3 LEVELS  
 SEX AT 2 LEVELS

## 4 CORRELATED FACTORS-

MEM AT 2 LEVELS  
 LST AT 2 LEVELS  
 CON AT 2 LEVELS  
 MAT AT 4 LEVELS

## INPUT DATA

## 4 SUBJECTS IN PRF 1 LEV 1 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 2.0 | 4.0 | 3.0 | 0.0 | 1.0 | 1.0 | 0.0 | 3.0 | 2.0 | 2.0 | 4.0 | 1.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 0.0 | 3.0 | 0.0 | 2.0 | 2.0 | 0.0 | 1.0 | 0.0 | 1.0 | 3.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 4.0 | 4.0 | 3.0 | 2.0 | 2.0 | 2.0 | 0.0 | 1.0 | 4.0 | 3.0 | 3.0 | 3.0 | 3.0 | 1.0 | 2.0 |
|   | 2.0 | 1.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 1.0 |
| 4 | 3.0 | 3.0 | 2.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 1 LEV 1 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 4.0 | 3.0 | 3.0 | 2.0 | 4.0 | 0.0 | 1.0 | 1.0 | 4.0 | 4.0 | 2.0 | 4.0 | 3.0 | 3.0 | 1.0 | 1.0 |
|   | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 1.0 | 4.0 | 4.0 | 4.0 | 1.0 | 1.0 | 1.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 4.0 | 2.0 | 1.0 | 1.0 |
|   | 0.0 | 1.0 | 2.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 1.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| 3 | 2.0 | 3.0 | 4.0 | 4.0 | 2.0 | 0.0 | 1.0 | 0.0 | 3.0 | 4.0 | 1.0 | 4.0 | 1.0 | 0.0 | 0.0 | 0.0 |
|   | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 4 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 0.0 | 1.0 | 0.0 | 1.0 | 2.0 | 1.0 | 2.0 | 1.0 | 0.0 | 1.0 | 0.0 |
|   | 0.0 | 1.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 |

## 4 SUBJECTS IN PRF 1 LEV 2 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 3.0 | 3.0 | 3.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 4.0 | 0.0 | 1.0 | 0.0 | 1.0 |
|   | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 2 | 3.0 | 3.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 2.0 | 1.0 | 3.0 | 1.0 | 0.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2.0 | 1.0 | 0.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | 3.0 | 0.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 3.0 | 4.0 | 3.0 | 3.0 | 2.0 | 1.0 | 1.0 | 1.0 | 3.0 | 3.0 | 0.0 | 4.0 | 1.0 | 1.0 | 1.0 | 1.0 |
|   | 1.0 | 3.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 |

PRF DATA BILL GARNER FEB 13, 1972

INPUT DATA 2CONTINUED&lt;

## 4 SUBJECTS IN PRF 1 LEV 2 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 2.0 | 2.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 3.0 | 1.0 | 3.0 | 0.0 | 1.0 | 1.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| 2 | 2.0 | 3.0 | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 |
|   | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2.0 | 3.0 | 2.0 | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | 2.0 | 3.0 | 1.0 | 2.0 | 2.0 | 0.0 | 0.0 | 1.0 |
|   | 1.0 | 2.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 |
| 4 | 4.0 | 3.0 | 2.0 | 3.0 | 1.0 | 0.0 | 1.0 | 0.0 | 1.0 | 3.0 | 1.0 | 4.0 | 2.0 | 0.0 | 0.0 | 0.0 |
|   | 2.0 | 2.0 | 1.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 1 LEV 3 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 3.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 3.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 3.0 | 4.0 | 2.0 | 2.0 | 3.0 | 1.0 | 0.0 | 0.0 | 2.0 | 3.0 | 3.0 | 2.0 | 1.0 | 1.0 | 0.0 | 1.0 |
|   | 2.0 | 1.0 | 2.0 | 0.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 3 | 4.0 | 4.0 | 3.0 | 2.0 | 3.0 | 1.0 | 1.0 | 0.0 | 4.0 | 2.0 | 1.0 | 4.0 | 2.0 | 0.0 | 2.0 | 0.0 |
|   | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 2.0 | 3.0 | 1.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 3.0 | 2.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 1 LEV 3 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 3.0 | 3.0 | 2.0 | 1.0 | 1.0 | 1.0 | 2.0 | 0.0 | 3.0 | 3.0 | 1.0 | 4.0 | 0.0 | 1.0 | 0.0 | 1.0 |
|   | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 3.0 | 0.0 | 2.0 | 1.0 | 0.0 | 1.0 | 0.0 | 2.0 | 3.0 | 2.0 | 3.0 | 2.0 | 1.0 | 0.0 | 1.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 3 | 4.0 | 3.0 | 4.0 | 4.0 | 3.0 | 1.0 | 3.0 | 1.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2.0 | 1.0 | 3.0 | 3.0 |
|   | 3.0 | 0.0 | 3.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 3.0 | 0.0 |
| 4 | 4.0 | 4.0 | 4.0 | 3.0 | 1.0 | 0.0 | 2.0 | 0.0 | 1.0 | 4.0 | 4.0 | 3.0 | 3.0 | 0.0 | 3.0 | 1.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |

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INPUT DATA %CONTINUED&lt;

## 4 SUBJECTS IN PRF 2 LEV 1 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 3.0 | 2.0 | 3.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.0 | 1.0 | 3.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 2.0 | 2.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 4.0 | 4.0 | 3.0 | 2.0 | 1.0 | 3.0 | 3.0 | 3.0 | 3.0 | 2.0 | 3.0 | 3.0 | 3.0 | 2.0 | 2.0 |
|   | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 1.0 | 1.0 |
| 3 | 4.0 | 2.0 | 3.0 | 4.0 | 1.0 | 1.0 | 1.0 | 0.0 | 4.0 | 3.0 | 2.0 | 3.0 | 2.0 | 0.0 | 1.0 | 0.0 |
|   | 1.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 4.0 | 4.0 | 2.0 | 2.0 | 2.0 | 1.0 | 0.0 | 0.0 | 2.0 | 1.0 | 3.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 2 LEV 1 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 4.0 | 2.0 | 2.0 | 2.0 | 0.0 | 1.0 | 1.0 | 1.0 | 4.0 | 1.0 | 3.0 | 2.0 | 1.0 | 1.0 | 0.0 |
|   | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 3.0 | 2.0 | 3.0 | 3.0 | 2.0 | 0.0 | 1.0 | 1.0 | 3.0 | 3.0 | 4.0 | 3.0 | 1.0 | 1.0 | 1.0 | 2.0 |
|   | 1.0 | 0.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 3.0 | 0.0 | 3.0 | 2.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 | 2.0 | 0.0 | 1.0 |
|   | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 |
| 4 | 1.0 | 2.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.0 | 0.0 | 1.0 | 1.0 | 2.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 2 LEV 2 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|   | 2.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 3.0 | 3.0 | 4.0 | 3.0 | 0.0 | 0.0 | 1.0 | 1.0 | 2.0 | 3.0 | 1.0 | 4.0 | 3.0 | 1.0 | 1.0 | 1.0 |
|   | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 |
| 3 | 1.0 | 2.0 | 3.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 3.0 | 2.0 | 3.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 | 3.0 | 4.0 | 2.0 | 2.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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## INPUT DATA %CONTINUED&lt;

## 4 SUBJECTS IN PRF 2 LEV 2 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 3.0 | 3.0 | 3.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 3.0 | 2.0 | 4.0 | 2.0 | 0.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 4.0 | 4.0 | 3.0 | 4.0 | 1.0 | 0.0 | 1.0 | 0.0 | 2.0 | 3.0 | 3.0 | 4.0 | 3.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2.0 | 3.0 | 1.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 | 2.0 | 2.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 1.0 |
|   | 2.0 | 2.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| 4 | 2.0 | 3.0 | 1.0 | 4.0 | 0.0 | 1.0 | 2.0 | 1.0 | 3.0 | 3.0 | 0.0 | 4.0 | 1.0 | 0.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 0.0 | 2.0 | 0.0 | 1.0 | 0.0 | 1.0 | 2.0 | 2.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 2 LEV 3 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 4.0 | 3.0 | 3.0 | 3.0 | 2.0 | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 0.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| 2 | 4.0 | 2.0 | 1.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 | 2.0 | 3.0 | 0.0 | 2.0 | 2.0 | 2.0 | 0.0 | 0.0 |
|   | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2.0 | 2.0 | 3.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 3.0 | 2.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 4 | 3.0 | 2.0 | 2.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 | 2.0 | 2.0 | 1.0 | 2.0 | 1.0 | 2.0 | 0.0 | 0.0 |
|   | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 2 LEV 3 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 4.0 | 4.0 | 4.0 | 2.0 | 2.0 | 1.0 | 2.0 | 0.0 | 3.0 | 3.0 | 1.0 | 4.0 | 0.0 | 0.0 | 0.0 | 2.0 |
|   | 0.0 | 3.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 2.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 2 | 2.0 | 1.0 | 1.0 | 1.0 | 2.0 | 1.0 | 1.0 | 0.0 | 1.0 | 2.0 | 1.0 | 4.0 | 3.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2.0 | 2.0 | 2.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 1.0 | 2.0 | 1.0 | 3.0 | 2.0 | 0.0 | 1.0 | 2.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 4 | 3.0 | 3.0 | 2.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 1.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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INPUT DATA %CONTINUED&lt;

## 4 SUBJECTS IN PRF 3 LEV 1 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 3.0 | 3.0 | 3.0 | 1.0 | 2.0 | 1.0 | 1.0 | 0.0 | 3.0 | 3.0 | 1.0 | 4.0 | 0.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 2.0 | 1.0 | 2.0 | 1.0 | 0.0 | 1.0 | 0.0 | 2.0 | 2.0 | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| 3 | 1.0 | 4.0 | 3.0 | 2.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 3.0 | 0.0 | 3.0 | 2.0 | 0.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 4.0 | 4.0 | 4.0 | 3.0 | 2.0 | 0.0 | 2.0 | 0.0 | 3.0 | 4.0 | 4.0 | 3.0 | 3.0 | 2.0 | 0.0 | 1.0 |
|   | 4.0 | 2.0 | 2.0 | 2.0 | 1.0 | 0.0 | 1.0 | 0.0 | 3.0 | 0.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 3 LEV 1 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 4.0 | 4.0 | 4.0 | 4.0 | 2.0 | 1.0 | 2.0 | 2.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2.0 | 1.0 | 1.0 | 0.0 |
|   | 3.0 | 0.0 | 2.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 2.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| 2 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 1.0 | 0.0 | 3.0 | 4.0 | 3.0 | 3.0 | 2.0 | 0.0 | 0.0 | 1.0 |
|   | 1.0 | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 2.0 | 1.0 | 0.0 | 0.0 | 1.0 |
| 3 | 4.0 | 4.0 | 1.0 | 3.0 | 1.0 | 0.0 | 1.0 | 0.0 | 4.0 | 3.0 | 2.0 | 3.0 | 2.0 | 1.0 | 0.0 | 1.0 |
|   | 3.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 4 | 3.0 | 3.0 | 2.0 | 3.0 | 2.0 | 0.0 | 1.0 | 1.0 | 4.0 | 4.0 | 3.0 | 3.0 | 2.0 | 1.0 | 0.0 | 1.0 |
|   | 2.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 |

## 4 SUBJECTS IN PRF 3 LEV 2 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 3.0 | 0.0 | 3.0 | 1.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 1.0 | 3.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 4.0 | 3.0 | 1.0 | 2.0 | 2.0 | 1.0 | 2.0 | 1.0 | 3.0 | 2.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 |
|   | 2.0 | 1.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 |
|   | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 3.0 | 3.0 | 4.0 | 4.0 | 2.0 | 1.0 | 0.0 | 0.0 | 1.0 | 4.0 | 0.0 | 3.0 | 1.0 | 2.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |

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INPUT DATA %CONTINUED&lt;

## 4 SUBJECTS IN PRF 3 LEV 2 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 2.0 | 3.0 | 3.0 | 2.0 | 1.0 | 3.0 | 0.0 | 2.0 | 2.0 | 1.0 | 4.0 | 1.0 | 0.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 1.0 | 2.0 | 2.0 | 3.0 | 2.0 | 0.0 | 1.0 | 0.0 | 2.0 | 4.0 | 2.0 | 2.0 | 0.0 | 1.0 | 0.0 | 1.0 |
|   | 1.0 | 1.0 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 3 | 4.0 | 4.0 | 3.0 | 3.0 | 3.0 | 0.0 | 2.0 | 0.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 1.0 | 0.0 | 1.0 |
|   | 2.0 | 1.0 | 1.0 | 3.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 |
| 4 | 3.0 | 3.0 | 4.0 | 4.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | 4.0 | 1.0 | 4.0 | 1.0 | 0.0 | 1.0 | 1.0 |
|   | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 3 LEV 3 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 1.0 | 2.0 | 3.0 | 2.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 2.0 | 3.0 | 3.0 | 0.0 | 0.0 | 1.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 4.0 | 4.0 | 4.0 | 4.0 | 2.0 | 0.0 | 1.0 | 0.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 2.0 | 0.0 | 0.0 |
|   | 2.0 | 1.0 | 4.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 |
| 3 | 3.0 | 3.0 | 2.0 | 3.0 | 2.0 | 1.0 | 1.0 | 0.0 | 1.0 | 3.0 | 3.0 | 4.0 | 2.0 | 1.0 | 1.0 | 1.0 |
|   | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 4.0 | 3.0 | 2.0 | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | 2.0 | 1.0 | 1.0 | 1.0 | 3.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 3 LEV 3 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 4.0 | 3.0 | 4.0 | 4.0 | 3.0 | 1.0 | 1.0 | 1.0 | 3.0 | 3.0 | 3.0 | 3.0 | 2.0 | 0.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 3.0 | 3.0 | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | 2.0 | 3.0 | 2.0 | 3.0 | 2.0 | 0.0 | 1.0 | 0.0 |
|   | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 3.0 | 4.0 | 4.0 | 0.0 | 0.0 | 1.0 | 1.0 | 3.0 | 4.0 | 3.0 | 4.0 | 1.0 | 1.0 | 0.0 | 1.0 |
|   | 2.0 | 3.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 4.0 | 3.0 | 4.0 | 2.0 | 2.0 | 1.0 | 2.0 | 0.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 1.0 | 1.0 | 2.0 |
|   | 3.0 | 3.0 | 1.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 2.0 | 3.0 | 3.0 | 4.0 | 2.0 | 1.0 | 0.0 | 0.0 |

PRF DATA BILL BAKER FEB 13, 1972

INPUT DATA %CONTINUED&lt;

## 4 SUBJECTS IN PRF 4 LEV 1 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 3.0 | 4.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 3.0 | 3.0 | 0.0 | 4.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 |
| 2 | 3.0 | 3.0 | 1.0 | 2.0 | 1.0 | 1.0 | 1.0 | 0.0 | 2.0 | 4.0 | 0.0 | 3.0 | 2.0 | 2.0 | 0.0 | 1.0 |
|   | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 2.0 | 3.0 | 3.0 | 2.0 | 0.0 | 2.0 | 1.0 | 2.0 | 1.0 | 0.0 | 4.0 | 3.0 | 1.0 | 3.0 | 0.0 |
|   | 2.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| 4 | 3.0 | 3.0 | 2.0 | 4.0 | 2.0 | 1.0 | 0.0 | 0.0 | 1.0 | 4.0 | 1.0 | 0.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 4 LEV 1 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 2.0 | 2.0 | 3.0 | 0.0 | 1.0 | 0.0 | 0.0 | 2.0 | 2.0 | 2.0 | 3.0 | 1.0 | 1.0 | 1.0 | 1.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| 2 | 4.0 | 2.0 | 3.0 | 4.0 | 1.0 | 0.0 | 1.0 | 0.0 | 3.0 | 4.0 | 1.0 | 4.0 | 0.0 | 1.0 | 0.0 | 0.0 |
|   | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| 3 | 3.0 | 2.0 | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 | 3.0 | 2.0 | 1.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 4.0 | 3.0 | 4.0 | 3.0 | 0.0 | 1.0 | 0.0 | 0.0 | 2.0 | 4.0 | 3.0 | 4.0 | 0.0 | 1.0 | 1.0 | 0.0 |
|   | 1.0 | 2.0 | 2.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 1.0 | 0.0 | 2.0 | 0.0 | 1.0 | 1.0 | 0.0 |

## 4 SUBJECTS IN PRF 4 LEV 2 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 4.0 | 3.0 | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 2.0 | 4.0 | 3.0 | 4.0 | 2.0 | 1.0 | 0.0 | 0.0 |
|   | 3.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 3.0 | 4.0 | 0.0 | 4.0 | 0.0 | 2.0 | 1.0 | 0.0 | 3.0 | 3.0 | 1.0 | 3.0 | 0.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 3.0 | 2.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 3.0 | 1.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 3.0 | 3.0 | 2.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 3.0 | 1.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 |
|   | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

PRF DATA BILL BARKER FEB 13, 1977

## INPUT DATA (CONTINUED)

## 4 SUBJECTS IN PRF 4 LEV 2 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 3.0 | 1.0 | 3.0 | 0.0 | 1.0 | 0.0 | 0.0 | 2.0 | 2.0 | 1.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 1.0 | 3.0 | 2.0 | 2.0 | 0.0 | 1.0 | 1.0 | 0.0 | 2.0 | 3.0 | 0.0 | 4.0 | 2.0 | 0.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2.0 | 3.0 | 1.0 | 3.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 2.0 | 0.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 |
|   | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 4.0 | 4.0 | 3.0 | 4.0 | 1.0 | 0.0 | 0.0 | 0.0 | 2.0 | 4.0 | 2.0 | 4.0 | 1.0 | 1.0 | 1.0 | 0.0 |
|   | 3.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 4 LEV 3 SEX 1

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 4.0 | 3.0 | 3.0 | 4.0 | 1.0 | 1.0 | 0.0 | 0.0 | 4.0 | 2.0 | 3.0 | 4.0 | 1.0 | 2.0 | 0.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 3.0 | 2.0 | 1.0 | 1.0 | 2.0 | 1.0 | 0.0 | 0.0 | 2.0 | 4.0 | 2.0 | 4.0 | 2.0 | 1.0 | 2.0 | 1.0 |
|   | 1.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 2.0 | 2.0 | 3.0 | 1.0 | 1.0 | 0.0 | 0.0 | 3.0 | 3.0 | 2.0 | 4.0 | 1.0 | 2.0 | 1.0 | 1.0 |
|   | 1.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 4 | 4.0 | 3.0 | 2.0 | 2.0 | 2.0 | 1.0 | 0.0 | 0.0 | 3.0 | 3.0 | 3.0 | 4.0 | 2.0 | 1.0 | 1.0 | 0.0 |
|   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## 4 SUBJECTS IN PRF 4 LEV 3 SEX 2

|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 2.0 | 1.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 1.0 | 3.0 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 3.0 | 0.0 | 3.0 | 2.0 | 0.0 | 1.0 | 0.0 |
|   | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 3.0 | 3.0 | 4.0 | 2.0 | 0.0 | 1.0 | 1.0 | 2.0 | 3.0 | 3.0 | 4.0 | 2.0 | 0.0 | 1.0 | 0.0 |
|   | 2.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 3.0 | 3.0 | 2.0 | 3.0 | 1.0 | 1.0 | 1.0 | 0.0 | 2.0 | 3.0 | 3.0 | 3.0 | 2.0 | 1.0 | 0.0 | 1.0 |
|   | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 |

## APPENDIX 6

### Immediate Recall Matrix

# Analysis of Variance

| Source of Variation |                 | DF | SS        | MS        | F       |                       |
|---------------------|-----------------|----|-----------|-----------|---------|-----------------------|
|                     | PRF             | 3  | 12.7727   | 4.2576    | 1.200   |                       |
|                     | LEV             | 2  | 18.8906   | 9.4453    | 2.662   | .10                   |
|                     | PRF LEV         | 6  | 9.5417    | 1.5903    | 0.448   |                       |
|                     | SEX             | 1  | 6.3809    | 6.3809    | 1.798   |                       |
|                     | PRF SEX         | 3  | 32.7363   | 10.9121   | 3.076   | .05                   |
|                     | LEV SEX         | 2  | 0.4844    | 0.2422    | 0.068   |                       |
|                     | PRF LEV SEX     | 6  | 19.1563   | 3.1927    | 0.900   |                       |
|                     | ERROR 1         | 72 | 255.4531  | 3.5480    |         | C.V. # 115.22 PERCENT |
|                     | PRF X LST       | 3  | 3.0055    | 1.0979    | 1.665   |                       |
|                     | LST             | 1  | 3.4694    | 3.4694    | 5.659   | .05                   |
|                     | PRF LEV LST     | 6  | 4.3281    | 0.7214    | 1.777   |                       |
|                     | SEX LST         | 1  | 3.2819    | 3.2819    | 5.353   | .05                   |
|                     | PRF SEX LST     | 3  | 2.0955    | 0.6985    | 1.139   |                       |
|                     | LEV SEX LST     | 2  | 0.5834    | 0.2917    | 0.476   |                       |
|                     | PRF LEV SEX LST | 6  | 3.9533    | 0.6589    | 1.075   |                       |
|                     | ERROR 2         | 72 | 44.1406   | 0.6131    |         | C.V. # 47.90 PERCENT  |
|                     | CON             | 1  | 1112.1406 | 1112.1406 | 800.616 | .001                  |
|                     | PRF CON         | 3  | 5.6416    | 1.8805    | 1.354   |                       |
|                     | LEV CON         | 2  | 0.4746    | 0.2373    | 0.171   |                       |
|                     | PRF LEV CON     | 6  | 12.2188   | 2.0365    | 1.466   |                       |
|                     | SEX CON         | 1  | 2.2656    | 2.2656    | 1.631   |                       |
|                     | PRF SEX CON     | 3  | 6.8828    | 2.2943    | 1.652   |                       |
|                     | LEV SEX CON     | 2  | 1.4434    | 0.7217    | 0.520   |                       |
|                     | PRF LEV SEX CON | 6  | 11.4785   | 1.9131    | 1.377   |                       |
|                     | ERROR 3         | 72 | 100.0156  | 1.3891    |         | C.V. # 72.10 PERCENT  |
|                     | LST CON         | 1  | 13.6875   | 13.6875   | 25.966  | .01                   |
|                     | PRF LST CON     | 3  | 1.1865    | 0.3955    | 0.750   |                       |
|                     | LEV LST CON     | 2  | 1.1299    | 0.5649    | 1.072   |                       |
|                     | PRF LEV LST CON | 6  | 2.9404    | 0.4901    | 0.930   |                       |
|                     | SEX LST CON     | 1  | 3.6621    | 3.6621    | 6.947   | .05                   |
|                     | PRF SEX LST CON | 3  | 2.9766    | 0.9922    | 1.882   |                       |

|                     |    |         |         |        |                      |
|---------------------|----|---------|---------|--------|----------------------|
| LEV SEX LST CON     | 2  | 0.6084  | 0.3042  | 0.577  |                      |
| PRF LEV SEX LST CON | 6  | 2.9150  | 0.4858  | 0.922  |                      |
| ERROR 4             | 72 | 37.9531 | 0.5271  |        | C.V. # 44.41 PERCENT |
| MAT                 | 1  | 70.4694 | 70.4694 | 78.721 | .01                  |
| PRF MAT             | 3  | 1.7520  | 0.5840  | 0.652  |                      |
| LEV MAT             | 2  | 0.9427  | 0.4714  | 0.527  |                      |
| PRF LEV MAT         | 6  | 3.8125  | 0.6354  | 0.710  |                      |
| SEX MAT             | 1  | 4.9276  | 4.9276  | 5.505  | .05                  |
| LEV SEX MAT         | 2  | 1.9845  | 0.8822  | 1.108  |                      |
| PRF LEV SEX MAT     | 6  | 6.2917  | 1.0486  | 1.171  |                      |
| ERROR 5             | 72 | 64.4531 | 0.8952  |        | C.V. # 57.88 PERCENT |
| LST MAT             | 1  | 1.5631  | 1.5631  | 3.284  | .10                  |
| PRF LST MAT         | 3  | 2.7100  | 0.9033  | 1.898  |                      |
| LEV LST MAT         | 2  | 7.6927  | 3.8464  | 8.082  | .01                  |
| PRF LEV LST MAT     | 6  | 4.6670  | 0.7778  | 1.634  |                      |
| SEX LST MAT         | 1  | 0.0060  | 0.0060  | 0.013  |                      |
| PRF SEX LST MAT     | 3  | 7.3825  | 2.4608  | 5.171  | .01                  |
| LEV SEX LST MAT     | 2  | 0.0467  | 0.0233  | 0.049  |                      |
| PRF LEV SEX LST MAT | 6  | 4.4788  | 0.7465  | 1.569  |                      |
| ERROR 6             | 72 | 34.2656 | 0.4759  |        | C.V. # 42.20 PERCENT |
| CON MAT             | 1  | 8.0209  | 8.0209  | 13.869 | .01                  |
| PRF CON MAT         | 3  | 0.8945  | 0.2982  | 0.516  |                      |
| LEV CON MAT         | 2  | 0.7662  | 0.3831  | 0.662  |                      |
| PRF LEV CON MAT     | 6  | 7.1074  | 1.1846  | 2.048  | .10                  |
| SEX CON MAT         | 1  | 0.2882  | 0.2882  | 0.498  |                      |
| PRF SEX CON MAT     | 3  | 0.0193  | 0.0064  | 0.011  |                      |
| LEV SEX CON MAT     | 2  | 1.1395  | 0.5698  | 0.985  |                      |
| PRF LEV SEX CON MAT | 6  | 1.6858  | 0.2810  | 0.486  |                      |
| ERROR 7             | 72 | 41.6406 | 0.5783  |        | C.V. # 46.52 PERCENT |
| LST CON MAT         | 1  | 6.3812  | 6.3812  | 12.869 | .01                  |
| PRF LST CON MAT     | 3  | 0.7822  | 0.2607  | 0.526  |                      |
| LEV LST CON MAT     | 2  | 0.4371  | 0.2186  | 0.441  |                      |
| PRF LEV LST CON MAT | 6  | 2.4072  | 0.4012  | 0.809  |                      |

|                         |    |          |          |         |                      |
|-------------------------|----|----------|----------|---------|----------------------|
| SEX LST CON MAT         | 1  | 0.0018   | 0.0018   | 0.004   |                      |
| PRF SEX LST CON MAT     | 3  | 2.0081   | 0.6694   | 1.350   |                      |
| LEV SEX LST CON MAT     | 2  | 0.4416   | 0.2208   | 0.445   |                      |
| PRF LEV SEX LST CON MAT | 6  | 2.9001   | 0.4833   | 0.975   |                      |
| ERROR 8                 | 72 | 35.7031  | 0.4959   |         | C.V. # 43.08 PERCENT |
| TYPE                    | 1  | 2.2662   | 2.2662   | 2.894   | .10                  |
| PRF TYPE                | 3  | 9.4863   | 3.1621   | 4.037   | .05                  |
| LEV TYPE                | 2  | 8.1302   | 4.0651   | 5.190   | .01                  |
| PRF LEV TYPE            | 6  | 2.7188   | 0.4531   | 0.579   |                      |
| SEX TYPE                | 1  | 0.1881   | 0.1881   | 0.240   |                      |
| PRF SEX TYPE            | 3  | 4.1578   | 1.3859   | 1.770   |                      |
| LEV SEX TYPE            | 2  | 0.2552   | 0.1276   | 0.163   |                      |
| PRF LEV SEX TYPE        | 6  | 1.2191   | 0.2032   | 0.259   |                      |
| ERROR 9                 | 72 | 56.3906  | 0.7832   |         | C.V. # 54.14 PERCENT |
| LST TYPE                | 1  | 35.9538  | 35.9538  | 75.410  | .01                  |
| PRF LST TYPE            | 3  | 1.0382   | 0.3461   | 0.726   |                      |
| LEV LST TYPE            | 2  | 0.0834   | 0.0417   | 0.087   |                      |
| PRF LEV LST TYPE        | 6  | 5.4325   | 0.9054   | 1.899   |                      |
| SEX LST TYPE            | 1  | 0.0789   | 0.0789   | 0.165   |                      |
| PRF SEX LST TYPE        | 3  | 0.7369   | 0.2456   | 0.515   |                      |
| LEV SEX LST TYPE        | 2  | 1.8958   | 0.9479   | 1.988   |                      |
| PRF LEV SEX LST TYPE    | 6  | 2.7651   | 0.4608   | 0.967   |                      |
| ERROR 10                | 72 | 34.3281  | 0.4768   |         | C.V. # 42.24 PERCENT |
| CON TYPE                | 1  | 120.9369 | 120.9369 | 294.388 | .001                 |
| PRF CON TYPE            | 3  | 1.1777   | 0.3926   | 0.956   |                      |
| LEV CON TYPE            | 2  | 1.1315   | 0.5657   | 1.377   |                      |
| PRF LEV CON TYPE        | 6  | 1.1680   | 0.1947   | 0.474   |                      |
| SEX CON TYPE            | 1  | 2.5853   | 2.5853   | 6.293   | .05                  |
| PRF SEX CON TYPE        | 3  | 1.5013   | 0.5004   | 1.218   |                      |
| LEV SEX CON TYPE        | 2  | 3.7643   | 1.8821   | 4.582   | .05                  |
| PRF LEV SEX CON TYPE    | 6  | 8.2194   | 1.3699   | 3.335   | .01                  |
| ERROR 11                | 72 | 29.5781  | 0.4108   |         | C.V. # 39.21 PERCENT |

|                          |   |        |        |            |
|--------------------------|---|--------|--------|------------|
| LST CON TYPE             | 1 | 8.6107 | 4.6107 | 16.202 .01 |
| PRF LST CON TYPE         | 3 | 2.8114 | 0.9371 | 1.763      |
| LEV LST CON TYPE         | 2 | 2.6608 | 1.3304 | 2.503 .10  |
| PRF LEV LST CON TYPE     | 6 | 2.7999 | 0.4667 | 0.878      |
| SEX LST CON TYPE         | 1 | 0.1858 | 0.1858 | 0.350      |
| PRF SEX LST CON TYPE     | 3 | 1.1723 | 0.3908 | 0.735      |
| LEV SEX LST CON TYPE     | 2 | 1.5701 | 0.7850 | 1.477      |
| PRF LEV SEX LST CON TYPE | 6 | 2.9859 | 0.4977 | 0.936      |

|          |    |         |        |        |               |
|----------|----|---------|--------|--------|---------------|
| ERROR 12 | 72 | 38.2656 | 0.5315 | C.V. # | 44.59 PERCENT |
|----------|----|---------|--------|--------|---------------|

|                      |   |         |         |            |
|----------------------|---|---------|---------|------------|
| MAT TYPE             | 1 | 15.6412 | 15.6412 | 40.560 .01 |
| PRF MAT TYPE         | 3 | 0.8923  | 0.2974  | 0.771      |
| LEV MAT TYPE         | 2 | 0.0052  | 0.0026  | 0.007      |
| PRF LEV MAT TYPE     | 6 | 1.1252  | 0.1875  | 0.486      |
| SEX MAT TYPE         | 1 | 0.0790  | 0.0790  | 0.205      |
| PRF SEX MAT TYPE     | 3 | 2.3618  | 0.7873  | 2.042      |
| LEV SEX MAT TYPE     | 2 | 0.9425  | 0.4713  | 1.222      |
| PRF LEV SEX MAT TYPE | 6 | 3.9995  | 0.6666  | 1.729      |

|          |    |         |        |        |               |
|----------|----|---------|--------|--------|---------------|
| ERROR 13 | 72 | 27.7656 | 0.3856 | C.V. # | 37.99 PERCENT |
|----------|----|---------|--------|--------|---------------|

|                          |   |        |        |            |
|--------------------------|---|--------|--------|------------|
| LST MAT TYPE             | 1 | 7.4539 | 7.4539 | 14.876 .01 |
| PRF LST MAT TYPE         | 3 | 1.7159 | 0.5720 | 1.141      |
| LEV LST MAT TYPE         | 2 | 0.4113 | 0.2057 | 0.410      |
| PRF LEV LST MAT TYPE     | 6 | 1.9891 | 0.3315 | 0.662      |
| SEX LST MAT TYPE         | 1 | 0.6250 | 0.6250 | 1.247      |
| PRF SEX LST MAT TYPE     | 3 | 0.3441 | 0.1147 | 0.229      |
| LEV SEX LST MAT TYPE     | 2 | 5.8184 | 2.9092 | 5.806 .01  |
| PRF LEV SEX LST MAT TYPE | 6 | 1.8766 | 0.3128 | 0.624      |

|          |    |         |        |        |               |
|----------|----|---------|--------|--------|---------------|
| ERROR 14 | 72 | 36.0781 | 0.5011 | C.V. # | 43.30 PERCENT |
|----------|----|---------|--------|--------|---------------|

|                      |   |        |        |           |
|----------------------|---|--------|--------|-----------|
| CON MAT TYPE         | 1 | 0.2357 | 0.2357 | 0.353     |
| PRF CON MAT TYPE     | 3 | 8.4163 | 2.8054 | 4.201 .01 |
| LEV CON MAT TYPE     | 2 | 2.0983 | 1.0491 | 1.571     |
| PRF LEV CON MAT TYPE | 6 | 2.0388 | 0.3398 | 0.509     |
| SEX CON MAT TYPE     | 1 | 1.5577 | 1.5577 | 2.333     |
| PRF SEX CON MAT TYPE | 3 | 0.1089 | 0.0363 | 0.054     |
| LEV SEX CON MAT TYPE | 2 | 1.5731 | 0.7866 | 1.178     |

|                              |      |           |        |       |        |               |
|------------------------------|------|-----------|--------|-------|--------|---------------|
| PRF LEV SEX CON MAT TYPE     | 6    | 2.4556    | 0.4093 | 0.613 |        |               |
| ERROR 15                     | 72   | 48.0781   | 0.6678 |       | C.V. # | 49.99 PERCENT |
| LST CON MAT TYPE             | 1    | 0.4016    | 0.4016 | 0.823 |        |               |
| PRF LST CON MAT TYPE         | 3    | 0.8866    | 0.2955 | 0.606 |        |               |
| LEV LST CON MAT TYPE         | 2    | 2.0262    | 1.0131 | 2.076 |        |               |
| PRF LEV LST CON MAT TYPE     | 6    | 1.1935    | 0.1989 | 0.408 |        |               |
| SEX LST CON MAT TYPE         | 1    | 0.0654    | 0.0654 | 0.134 |        |               |
| PRF SEX LST CON MAT TYPE     | 3    | 0.3688    | 0.1229 | 0.252 |        |               |
| LEV SEX LST CON MAT TYPE     | 2    | 0.1748    | 0.0874 | 0.179 |        |               |
| PRF LEV SEX LST CON MAT TYPE | 6    | 6.3051    | 1.0508 | 2.153 | .10    |               |
| ERROR 16                     | 72   | 35.1406   | 0.4881 |       | C.V. # | 42.73 PERCENT |
| ERROR DUE TO APPROXIMATION   |      | -0.0029   |        |       |        |               |
| TOTAL                        | 1535 | 2696.1035 |        |       |        |               |

## APPENDIX 7

### Delayed Recall Matrix

# Analysis of Variance

| Source of Variation |    | DF | SS       | MS       | F            |
|---------------------|----|----|----------|----------|--------------|
| PRF                 | 3  | 3  | 5.1321   | 1.7107   | 1.286        |
| LEV                 | 2  | 2  | 0.5482   | 0.2741   | 0.206        |
| PRF LEV             | 6  | 6  | 7.2175   | 1.2029   | 0.904        |
| SEX                 | 1  | 1  | 11.8652  | 11.8652  | 8.918 -.01   |
| PRF SEX             | 3  | 3  | 2.2103   | 0.7368   | 0.554        |
| LEV SEX             | 2  | 2  | 0.7383   | 0.3691   | 0.277        |
| PRF LEV SEX         | 6  | 6  | 2.3815   | 0.3969   | 0.298        |
| ERROR 1             | 72 | 72 | 95.7969  | 1.3305   |              |
| LST                 | 1  | 1  | 0.9902   | 0.9902   | 3.102 .10    |
| PRF LST             | 3  | 3  | 0.9499   | 0.3166   | 0.992        |
| LEV LST             | 2  | 2  | 0.5742   | 0.2871   | 0.899        |
| PRF LEV LST         | 6  | 6  | 1.5560   | 0.2593   | 0.812        |
| SEX LST             | 1  | 1  | 0.0319   | 0.0319   | 0.100        |
| PRF SEX LST         | 3  | 3  | 0.0953   | 0.0318   | 0.100        |
| LEV SEX LST         | 2  | 2  | 1.6498   | 0.8249   | 2.584 .10    |
| PRF LEV SEX LST     | 6  | 6  | 1.6058   | 0.2676   | 0.838        |
| ERROR 2             | 72 | 72 | 22.9844  | 0.3192   |              |
| CON                 | 1  | 1  | 104.6882 | 104.6882 | 134.377 .001 |
| PRF CON             | 3  | 3  | 1.6582   | 0.5527   | 0.709        |
| LEV CON             | 2  | 2  | 2.9778   | 1.4889   | 1.911        |
| PRF LEV CON         | 6  | 6  | 6.9023   | 1.1504   | 1.476        |
| SEX CON             | 1  | 1  | 4.9277   | 4.9277   | 6.323 .05    |
| PRF SEX CON         | 3  | 3  | 0.9810   | 0.3270   | 0.420        |
| LEV SEX CON         | 2  | 2  | 1.1993   | 0.5996   | 0.769        |
| PRF LEV SEX CON     | 6  | 6  | 1.9937   | 0.3323   | 0.426        |
| ERROR 3             | 72 | 72 | 56.1094  | 0.7793   |              |
| LST CON             | 1  | 1  | 4.4849   | 4.4849   | 13.022 .01   |
| PRF LST CON         | 3  | 3  | 0.4340   | 0.1447   | 0.420        |
| LEV LST CON         | 2  | 2  | 1.9936   | 0.9968   | 2.894 .10    |
| PRF LEV LST CON     | 6  | 6  | 1.1890   | 0.1982   | 0.575        |
| SEX LST CON         | 1  | 1  | 0.0529   | 0.0529   | 0.153        |

|                     |    |         |         |        |     |
|---------------------|----|---------|---------|--------|-----|
| PRF SEX LST CON     | 3  | 1.5961  | 0.5320  | 1.545  |     |
| LEV SEX LST CON     | 2  | 1.0897  | 0.5449  | 1.582  |     |
| PRF LEV SEX LST CON | 6  | 1.5504  | 0.2584  | 0.750  |     |
| ERROR 4             | 72 | 24.7969 | 0.3444  |        |     |
| MAT                 | 1  | 12.2194 | 12.2194 | 37.265 | .01 |
| PRF MAT             | 3  | 0.5020  | 0.1673  | 0.510  |     |
| LEV MAT             | 2  | 0.4232  | 0.2116  | 0.645  |     |
| PRF LEV MAT         | 6  | 1.4570  | 0.2428  | 0.741  |     |
| SEX MAT             | 1  | 0.0162  | 0.0162  | 0.049  |     |
| PRF SEX MAT         | 3  | 0.1841  | 0.0614  | 0.187  |     |
| LEV SEX MAT         | 2  | 0.3530  | 0.1765  | 0.538  |     |
| PRF LEV SEX MAT     | 6  | 2.1733  | 0.3622  | 1.105  |     |
| ERROR 5             | 72 | 23.6094 | 0.3279  |        |     |
| LST MAT             | 1  | 0.0005  | 0.0005  | 0.002  |     |
| PRF LST MAT         | 3  | 1.0018  | 0.3339  | 1.177  |     |
| LEV LST MAT         | 2  | 2.3608  | 1.1804  | 4.162  | .05 |
| PRF LEV LST MAT     | 6  | 1.5510  | 0.2585  | 0.911  |     |
| SEX LST MAT         | 1  | 0.0529  | 0.0529  | 0.187  |     |
| PRF SEX LST MAT     | 3  | 1.5544  | 0.5181  | 1.827  |     |
| LEV SEX LST MAT     | 2  | 1.4568  | 0.7284  | 2.568  | .10 |
| PRF LEV SEX LST MAT | 6  | 2.2874  | 0.3812  | 1.344  |     |
| ERROR 6             | 72 | 20.4219 | 0.2836  |        |     |
| CON MAT             | 1  | 3.8600  | 3.8600  | 13.609 | .01 |
| PRF CON MAT         | 3  | 0.9443  | 0.3148  | 1.110  |     |
| LEV CON MAT         | 2  | 0.0248  | 0.0124  | 0.044  |     |
| PRF LEV CON MAT     | 6  | 2.5537  | 0.4256  | 1.501  |     |
| SEX CON MAT         | 1  | 0.0789  | 0.0789  | 0.278  |     |
| PRF SEX CON MAT     | 3  | 0.6638  | 0.2213  | 0.780  |     |
| LEV SEX CON MAT     | 2  | 1.3918  | 0.6959  | 2.454  | .10 |
| PRF LEV SEX CON MAT | 6  | 1.2484  | 0.2081  | 0.734  |     |
| ERROR 7             | 72 | 20.4219 | 0.2836  |        |     |

|  |          |      |      |      |         |        |            |           |           |           |
|--|----------|------|------|------|---------|--------|------------|-----------|-----------|-----------|
|  | LST      | CON  | MAT  | 1    | 0.5477  | 0.5477 | 2.722      |           |           |           |
|  | PRF      | LST  | CON  | MAT  | 3       | 1.1430 | 0.3810     | 1.894     |           |           |
|  | LEV      | LST  | CON  | MAT  | 2       | 1.2121 | 0.6060     | 3.013 .10 |           |           |
|  | PRF      | LEV  | LST  | CON  | MAT     | 6      | 1.1675     | 0.1946    | 0.967     |           |
|  | SEX      | LST  | CON  | MAT  | 1       | 0.1460 | 0.1460     | 0.726     |           |           |
|  | PRF      | SEX  | LST  | CON  | MAT     | 3      | 0.3134     | 0.1045    | 0.519     |           |
|  | LEV      | SEX  | LST  | CON  | MAT     | 2      | 0.7778     | 0.3889    | 1.933     |           |
|  | PRF      | LEV  | SEX  | LST  | CON     | MAT    | 6          | 2.6456    | 0.4409    | 2.192 .05 |
|  | ERROR 8  |      |      | 72   | 14.4844 | 0.2012 |            |           |           |           |
|  |          | TYPE |      | 1    | 3.4694  | 3.4694 | 8.062 .01  |           |           |           |
|  |          | PRF  | TYPE | 3    | 1.8666  | 0.6222 | 1.446      |           |           |           |
|  |          | LEV  | TYPE | 2    | 0.3997  | 0.1999 | 0.464      |           |           |           |
|  |          | PRF  | LEV  | TYPE | 6       | 4.0846 | 0.6808     | 1.582     |           |           |
|  |          | SEX  | TYPE | 1    | 1.2037  | 1.2037 | 2.797 .10  |           |           |           |
|  |          | PRF  | SEX  | TYPE | 3       | 3.3193 | 1.1064     | 2.571 .10 |           |           |
|  |          | LEV  | SEX  | TYPE | 2       | 1.2514 | 0.6257     | 1.454     |           |           |
|  |          | PRF  | LEV  | SEX  | TYPE    | 6      | 2.1085     | 0.3514    | 0.817     |           |
|  | ERROR 9  |      |      | 72   | 30.9844 | 0.4303 |            |           |           |           |
|  |          | LST  | TYPE | 1    | 3.0995  | 3.0995 | 13.800 .01 |           |           |           |
|  |          | PRF  | LST  | TYPE | 3       | 0.3922 | 0.1307     | 0.582     |           |           |
|  |          | LEV  | LST  | TYPE | 2       | 0.5040 | 0.2520     | 1.122     |           |           |
|  |          | PRF  | LEV  | LST  | TYPE    | 6      | 1.1996     | 0.1999    | 0.890     |           |
|  |          | SEX  | LST  | TYPE | 1       | 0.2352 | 0.2352     | 1.047     |           |           |
|  |          | PRF  | SEX  | LST  | TYPE    | 3      | 0.9871     | 0.3290    | 1.465     |           |
|  |          | LEV  | SEX  | LST  | TYPE    | 2      | 0.5324     | 0.2662    | 1.185     |           |
|  |          | PRF  | LEV  | SEX  | LST     | TYPE   | 6          | 1.8156    | 0.3026    | 1.347     |
|  | ERROR 10 |      |      | 72   | 16.1719 | 0.2246 |            |           |           |           |
|  |          | CON  | TYPE | 1    | 4.2714  | 4.2714 | 15.733 .01 |           |           |           |
|  |          | PRF  | CON  | TYPE | 3       | 1.1475 | 0.3825     | 1.409     |           |           |
|  |          | LEV  | CON  | TYPE | 2       | 0.2931 | 0.1465     | 0.540     |           |           |
|  |          | PRF  | LEV  | CON  | TYPE    | 6      | 2.8271     | 0.4712    | 1.736     |           |
|  |          | SEX  | CON  | TYPE | 1       | 0.9904 | 0.9904     | 3.648 .10 |           |           |
|  |          | PRF  | SEX  | CON  | TYPE    | 3      | 0.2421     | 0.0807    | 0.297     |           |
|  |          | LEV  | SEX  | CON  | TYPE    | 2      | 1.4881     | 0.7440    | 2.741 .10 |           |

|     |     |     |       |      |      |         |        |        |       |
|-----|-----|-----|-------|------|------|---------|--------|--------|-------|
| PRF | LEV | SEX | CON   | TYPE | 6    | 1.6310  | 0.2718 | 1.001  |       |
|     |     |     | ERROR | 11   | 72   | 19.5469 | 0.2715 |        |       |
|     |     | LST | CON   | TYPE | 1    | 0.8915  | 0.8915 | 3.472  | .10   |
|     | PRF | LST | CON   | TYPE | 3    | 0.0391  | 0.0130 | 0.051  |       |
|     | LEV | LST | CON   | TYPE | 2    | 0.2823  | 0.1412 | 0.550  |       |
| PRF | LEV | LST | CON   | TYPE | 6    | 1.5762  | 0.2627 | 1.023  |       |
|     | SEX | LST | CON   | TYPE | 1    | 0.0314  | 0.0314 | 0.122  |       |
| PRF | SEX | LST | CON   | TYPE | 3    | 0.7086  | 0.2362 | 0.920  |       |
| LEV | SEX | LST | CON   | TYPE | 2    | 0.0409  | 0.0204 | 0.080  |       |
| PRF | LEV | SEX | LST   | CON  | TYPE | 6       | 1.332  | 0.1889 | 0.736 |
|     |     |     | ERROR | 12   | 72   | 18.4844 | 0.2567 |        |       |
|     |     | MAT | TYPE  | 1    |      | 3.2819  | 3.2819 | 12.488 | .01   |
|     | PRF | MAT | TYPE  | 3    |      | 0.7621  | 0.2540 | 0.967  |       |
|     | LEV | MAT | TYPE  | 2    |      | 0.4779  | 0.2390 | 0.909  |       |
| PRF | LEV | MAT | TYPE  | 6    |      | 2.0797  | 0.3466 | 1.319  |       |
|     | SEX | MAT | TYPE  | 1    |      | 0.1102  | 0.1102 | 0.419  |       |
| PRF | SEX | MAT | TYPE  | 3    |      | 2.4139  | 0.8046 | 3.062  | .05   |
| LEV | SEX | MAT | TYPE  | 2    |      | 0.2043  | 0.1021 | 0.389  |       |
| PRF | LEV | SEX | MAT   | TYPE | 6    | 0.6857  | 0.1143 | 0.435  |       |
|     |     |     | ERROR | 13   | 72   | 18.9219 | 0.2628 |        |       |
|     |     | LST | MAT   | TYPE | 1    | 0.4070  | 0.4070 | 1.585  |       |
|     | PRF | LST | MAT   | TYPE | 3    | 1.7316  | 0.5772 | 2.248  | .10   |
|     | LEV | LST | MAT   | TYPE | 2    | 1.4622  | 0.7311 | 2.848  | .10   |
| PRF | LEV | LST | MAT   | TYPE | 6    | 0.6883  | 0.1147 | 0.447  |       |
|     | SEX | LST | MAT   | TYPE | 1    | 1.5626  | 1.5626 | 6.087  | .05   |
| PRF | SEX | LST | MAT   | TYPE | 3    | 0.5108  | 0.1703 | 0.663  |       |
| LEV | SEX | LST | MAT   | TYPE | 2    | 0.6268  | 0.3134 | 1.221  |       |
| PRF | LEV | SEX | LST   | MAT  | TYPE | 6       | 1.2138 | 0.2023 | 0.788 |
|     |     |     | ERROR | 14   | 72   | 18.4844 | 0.2567 |        |       |
|     |     | CON | MAT   | TYPE | 1    | 0.6257  | 0.6257 | 2.614  |       |
|     | PRF | CON | MAT   | TYPE | 3    | 2.2526  | 0.7509 | 3.137  | .05   |
|     | LEV | CON | MAT   | TYPE | 2    | 0.7825  | 0.3912 | 1.634  |       |
| PRF | LEV | CON | MAT   | TYPE | 6    | 1.2845  | 0.2141 | 0.894  |       |

|                                |          |        |           |
|--------------------------------|----------|--------|-----------|
| SEX CON MAT TYPE 1             | 0.1878   | 0.1878 | 0.785     |
| PRF SEX CON MAT TYPE 3         | 0.5834   | 0.1945 | 0.812     |
| LEV SEX CON MAT TYPE 2         | 0.1345   | 0.0672 | 0.281     |
| PRF LEV SEX CON MAT TYPE 6     | 0.6021   | 0.1004 | 0.419     |
| ERROR 15 72                    | 17.2344  | 0.2394 |           |
| LST CON MAT TYPE 1             | 0.7086   | 0.7086 | 2.341     |
| PRF LST CON MAT TYPE 3         | 1.1566   | 0.3855 | 1.274     |
| LEV LST CON MAT TYPE 2         | 0.8715   | 0.4357 | 1.439     |
| PRF LEV LST CON MAT TYPE 6     | 1.3961   | 0.2327 | 0.769     |
| SEX LST CON MAT TYPE 1         | 0.8925   | 0.8925 | 2.948 .10 |
| PRF SEX LST CON MAT TYPE 3     | 1.7096   | 0.5699 | 1.882     |
| LEV SEX LST CON MAT TYPE 2     | 0.3361   | 0.1680 | 0.555     |
| PRF LEV SEX LST CON MAT TYPE 6 | 1.0697   | 0.1783 | 0.589     |
| ERROR 16 72                    | 21.7969  | 0.3027 |           |
| ERROR DUE TO APPROXIMATION     | -0.0050  |        |           |
| TOTAL 1535                     | 738.7026 |        |           |

## APPENDIX 8

### Overall Data Matrix

# Analysis of Variance

| Source of Variation |                 | DF | SS        | MS        | F        |      |                       |
|---------------------|-----------------|----|-----------|-----------|----------|------|-----------------------|
|                     | PRF             | 3  | 15.9870   | 5.3290    | 1.410    | .25  |                       |
|                     | LEV             | 2  | 7.9889    | 3.9945    | 1.057    |      |                       |
|                     | PRF LEV         | 6  | 13.0658   | 2.1776    | 0.576    |      |                       |
|                     | SEX             | 1  | 17.8242   | 17.8242   | 4.716    | .05  |                       |
|                     | PRF SEX         | 3  | 25.3503   | 8.4501    | 2.236    | .10  |                       |
|                     | LEV SEX         | 2  | 0.7168    | 0.3584    | 0.095    |      |                       |
|                     | PRF LEV SEX     | 6  | 14.6711   | 2.4452    | 0.647    |      |                       |
|                     | ERROR 1         | 72 | 272.1406  | 3.7797    |          |      | C.V. # 191.67 PERCENT |
|                     | MEM             | 1  | 1182.5627 | 1182.5627 | 1076.289 | .001 |                       |
|                     | PRF MEM         | 3  | 1.9180    | 0.6393    | 0.582    |      |                       |
|                     | LEV MEM         | 2  | 11.4502   | 5.7251    | 5.211    | .01  |                       |
|                     | PRF LEV MEM     | 6  | 3.6924    | 0.6154    | 0.560    |      |                       |
|                     | SEX MEM         | 1  | 0.4219    | 0.4219    | 0.384    |      |                       |
|                     | PRF SEX MEM     | 3  | 9.5957    | 3.1986    | 2.911    | .05  |                       |
|                     | LEV SEX MEM     | 2  | 0.5059    | 0.2529    | 0.230    |      |                       |
|                     | PRF LEV SEX MEM | 6  | 6.8662    | 1.1444    | 1.042    |      |                       |
|                     | ERROR 2         | 72 | 79.1094   | 1.0987    |          |      | C.V. # 103.34 PERCENT |
|                     | LST             | 1  | 4.0833    | 4.0833    | 7.313    | .01  |                       |
|                     | PRF LST         | 3  | 2.2734    | 0.7578    | 1.357    |      |                       |
|                     | LEV LST         | 2  | 3.9928    | 1.9964    | 3.575    | .05  |                       |
|                     | PRF LEV LST     | 6  | 2.0254    | 0.3376    | 0.605    |      |                       |
|                     | SEX LST         | 1  | 1.9805    | 1.9805    | 3.547    | .10  |                       |
|                     | PRF SEX LST     | 3  | 0.0956    | 0.3285    | 0.588    |      |                       |
|                     | LEV SEX LST     | 2  | 0.1426    | 0.0713    | 0.128    |      |                       |
|                     | PRF LEV SEX LST | 6  | 4.5632    | 0.7605    | 1.362    | .25  |                       |
|                     | ERROR 3         | 72 | 40.2031   | 0.5584    |          |      | C.V. # 73.67 PERCENT  |
|                     | MEM LST         | 1  | 0.3766    | 0.3766    | 1.007    |      |                       |
|                     | PRF MEM LST     | 3  | 1.7393    | 0.5798    | 1.550    | .25  |                       |
|                     | LEV MEM LST     | 2  | 0.9769    | 0.4884    | 1.306    |      |                       |
|                     | PRF LEV MEM LST | 6  | 3.8603    | 0.6434    | 1.721    | .25  |                       |
|                     | SEX MEM LST     | 1  | 1.3330    | 1.3330    | 3.565    | .10  |                       |

|                     |    |          |          |         |                       |
|---------------------|----|----------|----------|---------|-----------------------|
| PRF SEX MEM LST     | 3  | 1.2039   | 0.4013   | 1.073   |                       |
| LEV SEX MEM LST     | 2  | 2.0908   | 1.0454   | 2.796   | .10                   |
| PRF LEV SEX MEM LST | 6  | 0.9973   | 0.1662   | 0.445   |                       |
| ERROR 4             | 72 | 26.9219  | 0.3739   |         | C.V. # 60.29 PERCENT  |
| CON                 | 1  | 949.6301 | 949.6301 | 650.691 | .001                  |
| PRF CON             | 3  | 4.9920   | 1.6640   | 1.140   |                       |
| LEV CON             | 2  | 1.3015   | 0.6507   | 0.446   |                       |
| PRF LEV CON         | 6  | 14.7794  | 2.4632   | 1.688   | .25                   |
| SEX CON             | 1  | 6.9388   | 6.9388   | 4.754   | .05                   |
| PRF SEX CON         | 3  | 6.0208   | 2.0069   | 1.375   |                       |
| LEV SEX CON         | 2  | 0.0319   | 0.0159   | 0.011   |                       |
| PRF LEV SEX CON     | 6  | 9.1005   | 1.5168   | 1.039   |                       |
| ERROR 5             | 72 | 105.0781 | 1.4594   |         | C.V. # 119.10 PERCENT |
| MEM CON             | 1  | 267.1990 | 267.1990 | 376.875 | .001                  |
| PRF MEM CON         | 3  | 2.3068   | 0.7689   | 1.085   |                       |
| LEV MEM CON         | 2  | 2.1507   | 1.0753   | 1.517   | .25                   |
| PRF LEV MEM CON     | 6  | 4.3436   | 0.7239   | 1.021   |                       |
| SEX MEM CON         | 1  | 0.2536   | 0.2536   | 0.358   |                       |
| PRF SEX MEM CON     | 3  | 1.8405   | 0.6135   | 0.865   |                       |
| LEV SEX MEM CON     | 2  | 2.6117   | 1.3058   | 1.842   | .25                   |
| PRF LEV SEX MEM CON | 6  | 4.3741   | 0.7290   | 1.028   |                       |
| ERROR 6             | 72 | 51.0469  | 0.7090   |         | C.V. # 83.01 PERCENT  |
| LST CON             | 1  | 16.9218  | 16.9218  | 32.804  | .01                   |
| PRF LST CON         | 3  | 0.8464   | 0.2821   | 0.547   |                       |
| LEV LST CON         | 2  | 2.4668   | 1.2334   | 2.391   | .10                   |
| PRF LEV LST CON     | 6  | 2.9828   | 0.4971   | 0.964   |                       |
| SEX LST CON         | 1  | 1.4178   | 1.4178   | 2.748   | .10                   |
| PRF SEX LST CON     | 3  | 2.4488   | 0.8163   | 1.582   | .25                   |
| LEV SEX LST CON     | 2  | 0.1818   | 0.0909   | 0.176   |                       |
| PRF LEV SEX LST CON | 6  | 2.0906   | 0.3484   | 0.675   |                       |
| ERROR 7             | 72 | 37.1406  | 0.5158   |         | C.V. # 70.81 PERCENT  |

|              |     |     |     |          |         |         |        |        |               |
|--------------|-----|-----|-----|----------|---------|---------|--------|--------|---------------|
| MEM          | LST | CON | 1   | 1.2481   | 1.2481  | 3.509   | .10    |        |               |
| PRF          | MEM | LST | CON | 3        | 0.7757  | 0.2586  | 0.727  |        |               |
| LEV          | MEM | LST | CON | 2        | 0.6582  | 0.3291  | 0.925  |        |               |
| PRF          | LEV | MEM | LST | CON      | 6       | 1.1451  | 0.1909 | 0.537  |               |
| SEX          | MEM | LST | CON | 1        | 2.3000  | 2.3000  | 6.466  | .05    |               |
| PRF          | SEX | MEM | LST | CON      | 3       | 2.1225  | 0.7075 | 1.989  | .25           |
| LEV          | SEX | MEM | LST | CON      | 2       | 1.5145  | 0.7573 | 2.129  | .25           |
| PRF          | LEV | SEX | MEM | LST      | CON     | 6       | 2.3752 | 0.3959 | 1.113         |
| ERROR 8 72   |     |     |     | 25.6094  | 0.3557  |         |        | C.V. # | 58.80 PERCENT |
|              | MAT |     | 3   | 92.9869  | 30.9956 | 46.238  | .01    |        |               |
|              | PRF | MAT | 9   | 10.7395  | 1.1933  | 1.780   | .10    |        |               |
|              | LEV | MAT | 6   | 7.2377   | 1.2063  | 1.799   | .25    |        |               |
|              | PRF | LEV | MAT | 18       | 9.3015  | 0.5168  | 0.771  |        |               |
|              | SEX | MAT | 3   | 3.1627   | 1.0542  | 1.573   | .25    |        |               |
|              | PRF | SEX | MAT | 9        | 11.6938 | 1.2993  | 1.938  | .10    |               |
|              | LEV | SEX | MAT | 6        | 2.3587  | 0.3931  | 0.586  |        |               |
|              | PRF | LEV | SEX | MAT      | 18      | 10.5974 | 0.5887 | 0.878  |               |
| ERROR 9 216  |     |     |     | 144.7969 | 0.6704  |         |        | C.V. # | 80.72 PERCENT |
|              | MEM | MAT | 3   | 14.3608  | 4.7869  | 13.371  | .01    |        |               |
|              | PRF | MEM | MAT | 9        | 4.5194  | 0.5022  | 1.403  | .25    |               |
|              | LEV | MEM | MAT | 6        | 3.1412  | 0.5235  | 1.462  | .25    |               |
|              | PRF | LEV | MEM | MAT      | 18      | 5.9788  | 0.3322 | 0.928  |               |
|              | SEX | MEM | MAT | 3        | 3.3617  | 1.1206  | 3.130  | .05    |               |
|              | PRF | SEX | MEM | MAT      | 9       | 1.9225  | 0.2136 | 0.597  |               |
|              | LEV | SEX | MEM | MAT      | 6       | 2.6325  | 0.4388 | 1.226  |               |
|              | PRF | LEV | SEX | MEM      | MAT     | 18      | 5.8802 | 0.3267 | 0.913         |
| ERROR 10 216 |     |     |     | 77.3281  | 0.3580  |         |        | C.V. # | 58.99 PERCENT |
|              | LST | MAT | 3   | 33.0858  | 11.0286 | 25.863  | .01    |        |               |
|              | PRF | LST | MAT | 9        | 5.5885  | 0.6209  | 1.456  | .25    |               |
|              | LEV | LST | MAT | 6        | 10.2911 | 1.7152  | 4.022  | .01    |               |
|              | PRF | LEV | LST | MAT      | 18      | 10.1595 | 0.5644 | 1.324  | .25           |
|              | SEX | LST | MAT | 3        | 2.4232  | 0.8077  | 1.894  | .25    |               |
|              | PRF | SEX | LST | MAT      | 9       | 5.6212  | 0.6246 | 1.465  | .25           |

|    |                         |     |          |         |            |        |               |
|----|-------------------------|-----|----------|---------|------------|--------|---------------|
|    | LEV SEX LST MAT         | 6   | 6.8444   | 1.1407  | 2.675 .05  |        |               |
|    | PRF LEV SEX LST MAT     | 18  | 6.8769   | 0.3820  | 0.896      |        |               |
|    | ERROR 11                | 216 | 92.1094  | 0.4264  |            | C.V. # | 64.38 PERCENT |
|    | MEM LST MAT             | 3   | 15.3907  | 5.1302  | 16.383 .01 |        |               |
|    | PRF MEM LST MAT         | 9   | 3.0023   | 0.3336  | 1.065      |        |               |
|    | LEV MEM LST MAT         | 6   | 2.2245   | 0.3707  | 1.184      |        |               |
|    | PRF LEV MEM LST MAT     | 18  | 5.3668   | 0.2982  | 0.952      |        |               |
|    | SEX MEM LST MAT         | 3   | 0.1344   | 0.0448  | 0.143      |        |               |
|    | PRF SEX MEM LST MAT     | 9   | 5.8857   | 0.6540  | 2.088 .05  |        |               |
|    | LEV SEX MEM LST MAT     | 6   | 3.5355   | 0.5892  | 1.882 .10  |        |               |
|    | PRF LEV SEX MEM LST MAT | 18  | 7.5693   | 0.4205  | 1.343 .25  |        |               |
|    | ERROR 12                | 216 | 67.6406  | 0.3132  |            | C.V. # | 55.17 PERCENT |
|    | CON MAT                 | 3   | 86.5227  | 28.8409 | 58.918 .01 |        |               |
|    | PRF CON MAT             | 9   | 12.1133  | 1.3459  | 2.750 .01  |        |               |
|    | LEV CON MAT             | 6   | 3.1074   | 0.5179  | 1.058      |        |               |
|    | PRF LEV CON MAT         | 18  | 11.8019  | 0.6557  | 1.339 .25  |        |               |
|    | SEX CON MAT             | 3   | 4.0528   | 1.3509  | 2.760 .05  |        |               |
|    | PRF SEX CON MAT         | 9   | 2.1839   | 0.2427  | 0.496      |        |               |
|    | LEV SEX CON MAT         | 6   | 6.2266   | 1.0378  | 2.120 .10  |        |               |
|    | PRF LEV SEX CON MAT     | 18  | 10.1312  | 0.5628  | 1.150      |        |               |
|    | ERROR 13                | 216 | 105.7344 | 0.4895  |            | C.V. # | 68.98 PERCENT |
|    | MEM CON MAT             | 3   | 51.4266  | 17.1422 | 52.324 .01 |        |               |
|    | PRF MEM CON MAT         | 9   | 2.7197   | 0.3022  | 0.922      |        |               |
|    | LEV MEM CON MAT         | 6   | 1.9903   | 0.3317  | 1.013      |        |               |
|    | PRF LEV MEM CON MAT     | 18  | 5.1776   | 0.2876  | 0.878      |        |               |
|    | SEX MEM CON MAT         | 3   | 1.6337   | 0.5446  | 1.662 .25  |        |               |
|    | PRF SEX MEM CON MAT     | 9   | 0.9216   | 0.1024  | 0.313      |        |               |
| LE | LEV SEX MEM CON MAT     | 6   | 3.2665   | 0.5444  | 1.662 .25  |        |               |
|    | PRF LEV SEX MEM CON MAT | 18  | 5.7242   | 0.3180  | 0.971      |        |               |
|    | ERROR 14                | 216 | 70.7656  | 0.3276  |            | C.V. # | 56.43 PERCENT |
|    | LST CON MAT             | 3   | 10.2102  | 3.4034  | 7.595 .01  |        |               |
|    | PRF LST CON MAT         | 9   | 3.8006   | 0.4223  | 0.942      |        |               |
|    | LEV LST CON MAT         | 6   | 5.1660   | 0.8610  | 1.921 .25  |        |               |
|    | PRF LEV LST CON MAT     | 18  | 6.5422   | 0.3635  | 0.811      |        |               |

|                             |      |           |        |       |                      |
|-----------------------------|------|-----------|--------|-------|----------------------|
| SEX LST CON MAT             | 3    | 0.3329    | 0.1110 | 0.248 |                      |
| PRF SEX LST CON MAT         | 9    | 3.0492    | 0.3388 | 0.756 |                      |
| LEV SEX LST CON MAT         | 6    | 1.9895    | 0.3316 | 0.740 |                      |
| PRF LEV SEX LST CON MAT     | 18   | 10.3636   | 0.5758 | 1.285 | .25                  |
| ERROR 15                    | 216  | 96.7969   | 0.4481 |       | C.V. # 66.00 PERCENT |
| MEM LST CON MAT             | 3    | 7.3300    | 2.4433 | 7.868 | .01                  |
| PRF MEM LST CON MAT         | 9    | 3.0062    | 0.3340 | 1.076 |                      |
| LEV MEM LST CON MAT         | 6    | 2.3253    | 0.3876 | 1.248 |                      |
| PRF LEV MEM LST CON MAT     | 18   | 4.0106    | 0.2228 | 0.717 |                      |
| SEX MEM LST CON MAT         | 3    | 0.9934    | 0.3311 | 1.066 |                      |
| PRF SEX MEM LST CON MAT     | 9    | 3.2624    | 0.3625 | 1.167 |                      |
| LEV SEX MEM LST CON MAT     | 6    | 1.3484    | 0.2247 | 0.724 |                      |
| PRF LEV SEX MEM LST CON MAT | 18   | 6.6453    | 0.3692 | 1.189 |                      |
| ERROR 16                    | 216  | 67.0781   | 0.3105 |       | C.V. # 54.94 PERCENT |
| ERROR DUE TO APPROXIMATION  |      | -0.0154   |        |       |                      |
| TOTAL                       | 3071 | 4617.3672 |        |       |                      |

## APPENDIX 9

Statistically Significant Factors at High, Average  
and Low Levels

| Level   | Interaction         | DF | SS       | MS       | F       |
|---------|---------------------|----|----------|----------|---------|
| High    | MEM                 | 1  | 427.9727 | 427.9727 | 271.527 |
|         | SEX MEM LST         | 1  | 3.0625   | 3.0625   | 6.417   |
|         | CON                 | 1  | 297.5625 | 297.5625 | 149.707 |
|         | MEM CON             | 1  | 86.7227  | 86.7227  | 104.804 |
|         | LST CON             | 1  | 9.3789   | 9.3789   | 18.636  |
|         | SEX MEM LST CON     | 1  | 3.5156   | 3.5156   | 14.555  |
|         | MAT                 | 3  | 37.0703  | 12.3568  | 16.625  |
|         | MEM MAT             | 3  | 6.7695   | 2.2565   | 5.430   |
|         | LST MAT             | 3  | 16.5664  | 5.5221   | 11.335  |
|         | MEM LST MAT         | 3  | 6.0703   | 2.0234   | 5.126   |
|         | CON MAT             | 3  | 23.2578  | 7.7526   | 16.891  |
|         | PRF CON MAT         | 9  | 11.8594  | 1.3177   | 2.871   |
|         | MEM CON MAT         | 3  | 16.8945  | 5.6315   | 15.969  |
|         | MEM LST CON MAT     | 3  | 2.3672   | 0.7891   | 2.360   |
| Average | MEM                 | 1  | 294.3369 | 294.3369 | 362.406 |
|         | LST                 | 1  | 7.7354   | 7.7354   | 21.011  |
|         | MEM LST             | 1  | 1.3369   | 1.3369   | 4.919   |
|         | CON                 | 1  | 350.3916 | 350.3916 | 314.462 |
|         | MEM CON             | 1  | 71.7197  | 71.7197  | 98.052  |
|         | LST CON             | 1  | 8.8135   | 8.8135   | 13.099  |
|         | MEM LST CON         | 1  | 1.1963   | 1.1963   | 2.938   |
|         | PRF SEX MEM LST CON | 3  | 3.1357   | 1.0452   | 2.567   |
|         | MAT                 | 3  | 34.5811  | 11.5270  | 19.453  |
|         | MEM MAT             | 3  | 5.2217   | 1.7406   | 7.409   |
|         | PRF MEM MAT         | 9  | 4.2354   | 0.4706   | 2.003   |
|         | LST MAT             | 3  | 9.4170   | 3.1390   | 6.808   |
|         | MEM LST MAT         | 3  | 8.4248   | 2.8083   | 9.401   |
|         | CON MAT             | 3  | 39.7920  | 13.2640  | 26.499  |
|         | SEX CON MAT         | 3  | 4.1748   | 1.3916   | 2.780   |
|         | MEM CON MAT         | 3  | 20.8545  | 6.9515   | 22.268  |
|         | SEX MEM CON MAT     | 3  | 2.1357   | 0.7119   | 2.281   |
|         | LST CON MAT         | 3  | 7.6045   | 2.5348   | 4.740   |
| Low     | MEM                 | 1  | 471.7041 | 471.7041 | 519.568 |
|         | PFR MEM LST         | 3  | 3.9951   | 1.3317   | 3.573   |
|         | CON                 | 1  | 302.9775 | 302.9775 | 237.375 |
|         | MEM CON             | 1  | 110.9072 | 110.9072 | 195.248 |
|         | SEX MEM CON         | 1  | 2.1572   | 2.1572   | 3.798   |
|         | LST CON             | 1  | 1.1963   | 1.1963   | 3.221   |
|         | SEX LST CON         | 1  | 1.0635   | 1.0635   | 2.863   |
|         | PRF SEX LST CON     | 3  | 2.9795   | 0.9932   | 2.674   |

Continued...

Statistically Significant Factors at High, Average  
and Low Levels (Con't)

| Level | Interaction         | DF | SS      | MS     | F      |
|-------|---------------------|----|---------|--------|--------|
| Low   | MAT                 | 3  | 28.5732 | 9.5244 | 14.105 |
|       | MEM MAT             | 3  | 5.5107  | 1.8369 | 4.337  |
|       | SEX MEM MAT         | 3  | 4.9248  | 1.6416 | 3.876  |
|       | LST MAT             | 3  | 17.3936 | 5.7979 | 17.513 |
|       | SEX LST MAT         | 3  | 6.5967  | 2.1989 | 6.642  |
|       | MEM LST MAT         | 3  | 3.1201  | 1.0400 | 4.228  |
|       | PRF SEX MEM LST MAT | 9  | 8.3213  | 0.9246 | 3.759  |
|       | CON MAT             | 3  | 26.5811 | 8.8604 | 17.407 |
|       | SEX CON MAT         | 3  | 5.6436  | 1.8812 | 3.696  |
|       | MEM CON MAT         | 3  | 15.6670 | 5.2223 | 16.421 |
|       | SEX MEM CON MAT     | 3  | 2.2607  | 0.7536 | 2.369  |
|       | LST CON MAT         | 3  | 7.0498  | 2.3499 | 7.440  |