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BLOCKING OF AN EXTERNAL SIGNAL THROUGH SELF-PROJECTED IMAGERY: THE ROLE OF INNER-ACCEPTANT PERSONALITY STYLE AND CATEGORIES OF IMAGERY

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CHAPTER I

INTRODUCTION

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In recent years there has been an enormous increase in work on internal processes: dreams, daydreams and fantasies, attention, feeling and emotions, and altered states of consciousness. This resurgence of interest in subjective, conscious processes has led psychologists to reconsider one of the oldest of mental phenomena: the mental image. The relevant material subsumed under the heading of mental imagery is large and covers the entire history of experimental psychology. Neisser (1970, p. 159) recently stated:

> The problem of imagery stands at the very center of psychology. It belongs partly to the study of perception, partly to memory, partly to motivation; it can be considered from a developmental point of view and with regard to individual differences; traditionally it belongs to the psychology of thinking.

When psychology emerged from philosophy and physiology as a separate discipline during the latter half of the nineteenth century, the concept of image was an important part of its conceptual structure. The psychology of the 1890s was a science of mind, its contents, and their laws, as revealed by observation and experiment based on analytic introspection. Wundt (1897) defined psychology as the study of mental elements (sensations, images, feelings) and their combinations into

Vorstellungen (perceptions, ideas). The three basic elements of consciousness which seemed to be verified by the introspective observations of Wundt and later of Titchener came down all the way from Aristotle via the British empiricist philosophers. Images were designated as the basic elements or "atoms" of thought and were considered to assemble according to the various laws of association.

David Hume's (1751) formulation is the prototype of early theories of cognition in which images were basic elements. The mind, he said, contains impressions and ideas. Impressions, what we would call sensations or perceptions, occur in the presence of an object. Ideas, replicas of the impression-what we would call images-, occur in the absence of an object. Ideas differ from impressions only in degree of vivacity or intensity: impressions are vivid whereas images are faint copies of original impressions. Thus, there can be nothing in the mind that did not first arise in experience. The distinction between impression and idea seems obvious today but, at that time, it was a striking departure from traditional thinking. Although a philosopher and not inclined to test his assumptions experimentally, Hume's distinction between perception and imagery became the subject of some interesting psychology experiments (Külpe, 1902; Perky, 1910).

At Wurzburg, however, Külpe's students and associates carried out a series of experiments (during the years 1901-1908) that had a profound impact on the study of imagery and the whole introspective undertaking. They studied thinking by putting subjects in problem situations and then asking them

immediately afterward to describe what had gone on in their minds. The disturbing finding was that while thought obviously occurred, correct judgements were made, the reported conscious contents did not seem adequate to account for the performance, i.e., imagery was not reported. The Wurzburg interpretation of this imageless gap in thinking was that there were impalpable awarenesses which did not appear in consciousness as contents usually did and which should be regarded as functions. Wundt responded with critical arguement and disputed the possibility of imageless thought and impugned the scientific methods of the Wurzburg school. When introspection failed to yield any clear images, Titchener (1899) felt that images were nonetheless present but might be images of kinesthetic or spatial quality that were hard to recognize or describe.

The image-imageless thought controversy signaled the end of the line for a method which yielded nothing that made any sense. A different approach was needed to get psychology into a more fruitful area. A psychology that was not founded on the study of consciousness was clearly demanded. During the years just before the first World War, the solution proposed was that of Watson's behaviorism. The hegemony of behaviorism in the subsequent decades with its extreme stimulus-response approach and rejection of intervening constructs was a period of neglect for the study of imagery. Thus the study of imagery came to be avoided when introspective techniques were replaced by operationism.

The re-emergence of interest in imagery is due in large part to the successful application of methods, which originated

at many different times and places, but all of which are adapted to the purpose of improving our understanding of imagery as a higher cognitive function (Holt, 1964). Hebb (1968, 1969) has recently tried to clarify **the** role of imagery in cognitive functioning. According to Hebb (1969), reporting imagery, or describing it, is not necessarily introspective; such report does not transcend the rules of objective psychology, in which mental processes are examined by inference, and not by direct observation. It is proposed by Hebb (1968) that imagery is the re-excitation of the same or most of the same cell assemblies that were excited during the original perception. This new view of imagery, forcefully enunciated by Neisser (1966), ushered in the recent resurgence of interest in imagery.

Individual Differences in Imagery

In 1860 Gustav Theodor Fechner reported in his book on the Elements of Psychophysics that many persons lack imagery. Some twenty years later Sir Francis Galton (1883) announced astonishing results of a questionnaire on mental imagery. Galton's (1883, p. 158) survey, the first large-scale questionnaire in psychology, began as follows:

> Before addressing yourself to any of the Questions, think of some definite object- -suppose it is your breakfast-table as you sat down to it this morning- -and consider carefully the picture that rises before your mind's eye.
>
> (Questions)
>
> 1. Illumination-Is the image dim or fairly clear? Is its brightness comparable to that of the actual scene?
> 2. Definition-Are all the objects pretty well defined at the same time, or is the place of sharpest definition at any one moment more contracted than it is in a real scene?
> 3. Colouring-Are the colours of the china, of the toast, breadcrust, mustard, meat, parsley, or whatever may have been on the table, quite distinct and natural?

Many of Galton's subjects were scientific men, chosen as the most likely to give accurate answers. Curiously enough they were very deficient in imagery. They had no more notion of the true nature of imagery, says Galton, than a color-blind man has of the true nature of color. At the other extreme, non-scientific persons reported seeing the breakfast table as clearly as if it were actually present. Most subjects saw at least one or two of the items quite distinctly. Women and children had more distinct and vivid imagery than men. Galton attributed the scholars' and scientists' lack of imagery to their practice of abstract thinking carried on in symbols. He also found that many persons' imagery improved through practice.

Galton's survey did not show that persons belong to one or another sensory category according to their dominant imagery. Other investigators asserted this, however, and soon it was said that some persons were visualizers, meaning they were strong in visual imagery and weak in all other types. Other persons were "audiles", with dominant auditory imagery. Still others were "motiles" or "kinesthetes", since their motor or kinesthetic imagery was keenest.

An American psychologist, G.H. Betts (1909), prepared an imagery questionnaire, more complete than Galton's. This questionnaire consisted of 150 stimulus items concerning imagery from seven sense modalities (visual, auditory, kinesthetic, cutaneous, gustatory, olfactory, and organic) and required the subject to rate each image for vividness on a 7-point scale. The questionnaire was administered to various groups

of subjects ranging from ordinary citizens to trained psychologists. The results showed that few subjects were lacking in the ability to evoke images and that considerable individual differences existed in the degree of clearness and vividness of the subjects' images. Females typically reported more vivid imagery than males for items of a given modality, but these differences were were not as large as some inter-modality differences. These results provided no support for the notion of imagery types since subjects' imagery was not exclusive to a particular modality. The findings of Betts' study were recently confirmed by Sheehan (1967a) in his work on the modification of the original Betts questionnaire: persons with vivid images in one mode usually formed vivid images in general. Persons differed more in terms of general vividness of reported imagery than in specificity of mode of imagery.

Galton's (1883) and Betts' (1909) studies were criticized because each subject rated the quality of his own images and the reliability of such subjective data seemed dubious. Psychologists tried to devise really objective tests of imagery, the performance of which presumably depended on particular modes of imagery. Several methods were tried by James Rowland Angell (1910) and by Mabel R. Fernald (1912) but none determined exactly the subject's predominant type of imagery. For example, a subject was asked to name as many colored objects as possible in a given time; then he did the same for objects having sounds. The longer list is supposed to tell which imagery is stronger. The trouble is, a subject may get a perfectly good visual image of a noisy object, or might

have an auditory image for something colored, like a child's musical toy. Or again, a subject may be asked to visualize a long word, then read off the letters in it from right to left. While this seemed to be a fair test of visual imagery, there is no assurance that auditory or motor imagery is excluded.

A well-known "objective" measure of imagery was the Aussage (testimony) test, devised by the experimental psychologist William Stern (1938). Originally the test was used to check memory accuracy. A picture is shown briefly and the subject recalls as many details as possible. Stern (1938) found no subjects able to form an accurate visual image from which details could be read off, as from a photograph. Fernald (1912) found verbal as well as visual imagery employed; subjects named things to themselves as they looked at the picture. Unfortunately, the so-called objective imagery tests, like the questionnaire studies, could not present any evidence that validly and reliably indicate the type and quality of imagery used.

Angell (1910), Woodworth (1938) and, more recently, Sheehan (1966b) have called attention to the distinction between objective and subjective methods of studying imagery. Sheehan (1966b, p.1012) wrote:

> Complete reliance on the veracity of introspection can be distinguished from the correlation of an introspective report with objective or publicly observable behavior. A study is considered objective if it correlates variations in subjects' introspective reporting with variations in their behavior when imaging. A subjective study discusses only subjects' introspections about imaging. The distinction between the two types of studies can be applied more readily to some experiments than to others.

The Perky Effect: An Experimental Approach to Perception-Imagery Discrimination

The classic demonstration by C.W. Perky (1910), a student of Titchener, illustrates the distinction between objective and subjective methods of studying imagery. The experiment by Perky was based on an earlier investigation by Külpe (1902) which, in turn, was based on the distinction between perception and imagery noted by Hume (1751) and maintained by Titchener (1899)

Külpe (1902) tested whether sensations and images could be distinguished. Subjects placed before a screen in a darkened room were told to judge whether or not a dimly lighted square, which could be varied in its attributes, appeared on the screen. Though sometimes no stimulus was shown, the subjects thought they saw it. Thus images were assumed, wrongly, to be visual sensations. This tendency to "objectivize" visual events was explained in terms of subjects' expectations and the adaptive value of recognizing external events. Occasionally the reverse occurred: subjects thought a patch of light was merely their own image.

Perky (1910) used a similar procedure but reversed the instructions. Rather than alerting subjects to the possible presence of stimuli, she instructed subjects to expect only subjective experiences. Subjects were asked to imagine six successive objects (e.g., a tomato, a banana, a leaf) and to project the image on a screen placed before them. Unbeknown to the subject an apparatus behind the screen permitted the projection of weak colored lights which resembled the objects. Each time the subject was asked to summon up an image, the appropriate form was gradually brought from below threshold

to a threshold level of brightness and then immediately extinguished. At the end of the series, subjects were surprised and sometimes chagrined when the experimenter asked if they had really imagined all those things. Except when technical errors occured, all of the subjects assumed they were experiencing internal imagery and never experienced the stimulation as perceptual in nature. She tentatively concluded that there was an essential similarity of imagery and perception.

Because Perky's (1910) experiment cast doubt on the distinction between internal imagery and external reality, it has frequently been cited as evidence for the inherent weakness of introspection as a technique (Woodworth, 1938). It should be noted, however, that Perky was distinguishing between imagery and reality on the basis of the presence or absence of an objective stimulus. This is not a distinction on the basis of conscious contents and seems inconsistent from the point of view of a structuralist. Perky's findings may represent an adequate introspective report: under some circumstances (e.g., perceptual restriction), the distinction between reality and imagery is relative, arbitrary, or nonexistent. Although her methods were not precise, Perky's experiment might be viewed as the first objective study of imagery.

Six decades later the Perky effect is being re-investigated with more modern methods. In extensive research by Segal and her various collaborators (Segal, 1970, 1971), the main findings have been repeatedly verified: individuals fail to identify supraliminal stimuli, when they are engaged in imaging.

This blocking effect of imagery on perception was present even when simple colored forms were used, when these forms were brightened abruptly rather than gradually, when blank trials were introduced where the subject is asked to imagine an object when no stimulus is present. Informing the subject that projections may be shown, questioning the subject after each image rather than after all the images, and having the subject project the slides himself failed to eliminate Perky's phenomenon.

The 1910 Perky procedure has been recast as a signal detection problem (Segal and Fusella, 1970, 1971; Segal and Gordon, 1969). The subject serving in the Perky task sits with his face inside a translucent cylinder and is required to discriminate dimly illuminated but above threshold figures projected on the screen at the end of the cylinder. The subject is given many trials, half with signal present and half with signal absent. The intensity of the signal is controlled by the experimenter and is systematically raised or lowered, according to the subject's sensitivity, to find a level where the subject is making between 15% and 25% errors. This level is then maintained for the remainder of the session. Next, the subject is given a series of imaging trials (again, half with signal present, half with signal absent): on each trial he is asked to imagine something and to report the presence or absence of a signal when his image fades. The procedure is concluded with a second discrimination task, like the first. In order to evaluate the effects of imagery on perception, accuracy in signal detection during imaging may be compared

to the 80% level of accuracy established during discrimination. As a check for practice or fatigue effects, accuracy in signal detection during the second discrimination may be compared to the level in the first discrimination.

The following results have been obtained many times (Segal and Fusella, 1969, 1970, 1971; Segal and Gordon, 1969): when a subject is concurrently imagining common items and detecting signals, he frequently fails to discriminate between his image and an external stimulus. Compared to a condition where he is asked only to discriminate between the presence and absence of an external stimulus, the subject who is simultaneously imaging and detecting signals is more likely to report the presence of an external signal when it is actually absent ("hallucination") and more likely to miss detecting the presence of an external signal when it is actually present. This is true whether accuracy during imaging is compared to the first or second discrimination task. Accuracy scores were not significantly different across discrimination conditions (first vs. second) but they were significantly different across signal detection conditions (imaging vs. first discrimination, imaging vs. second discrimination). In general, accuracy during imaging dropped to 60%.

However, the purpose of redesigning the Perky procedure was to apply the statistics of signal detection theory. In signal detection experiments, a measure of criterion or response bias (Lx) and a relatively pure and independent measure of sensitivity (d') can be obtained by calculating the probability of "signal present" responses on the trials when a signal was

indeed present ("hits") and the probability of "signal present" responses on blank trials ("false alarms") (Freeman, 1964). The theory of signal detection (Swets, 1961) assumes that presentation of a stimulus configuration S produces in the subject a sensory datum called the observation. As a result of repeated presentations, these observations form a normal distribution. Repeated presentations of Not S (N) form a similar distribution partially overlapping with the distribution for S. On any given trial the subject's task is to decide if a given observation is more representative of the S distribution or the N distribution. The difference between the mean for the N distribution and the mean for the S distribution (d') measures the subject's ability to discriminate.

It is further assumed (Swets, 1961) that the subject can make a decision about external events based upon an observation by comparing it with some criterion observation. He is assumed to establish some cutoff point, criterion (Lx), on the common continuum of observations for N and S. Any observation falling above Lx will be considered more representative of S than N and lead to the response "signal present". Any observation falling below Lx will conversely lead to the response "nothing". If the subject sets his subjective cutoff point very high, he will accrue few hits and few false alarms and will be said to have a strict or conservative criterion for reporting "signal present". If he sets his cutoff point very low, hits and false alarms will be increased and he will be said to have a lenient or liberal criterion.

In the Perky procedure, measures of d' and Lx can be

established for the imaging task, and a separate d' and Lx can be established for the discrimination task; comparisons can be made of the subject's sensitivity and criterion in the two conditions. In previous research (Segal, 1970, 1971), d' has been consistently and significantly smaller during imaging whereas Lx has varied unsystematically.

These results have been cited as evidence for the communality of imaging and perceiving, i.e., image formation and perception occupy overlapping channels for cognitive processing (Horowitz, 1970, 1972; Neisser, 1972; Segal, 1971). These data do indicate that subjects may get the two processes mixed up, and may interpret or appraise internal images as real perceptions, or real perceptions as internal images. It is known that perceptual events may influence image formation (e.g., subliminal effect) and internal images may influence the interpretation of perceptual stimuli (e.g., selective perception).

The issue of the relationship between imagery and perception has been outlined in contemporary terms by Neisser (1967, 1970). According to Neisser, the development of an image and the development of a percept are both constructions, both dependent upon some sensory input and peripheral activity and some expectations and central integration. He has argued that the processes of imagery were closely related to those of perception itself and that both were instances of active construction rather than passive registration and recall. Modern science has made it abundantly clear that an external signal undergoes many transformations, interpretations, and recombinations before a person experiences seeing. Neisser's position describes imagery as sharing these processes.

This conceptualization and the several lines of investigation which point toward its feasibility (Antrobus, Singer, Goldstein, and Fortgang, 1970; Atwood, 1971; Brooks, 1967, 1968; Segal and Fusella, 1970) suggest that experience is a constant flux and not segregated into separate modalities of input (e.g., perception, memory, imagination). It is sometimes assumed, and was outlined by Freud (1911) as well as others, that external input enters the system through a channel labelled perception and is accompanied by the conscious experience of perceptions. Likewise, memory and imagery, while both internal processes deriving from traces of past experience, are considered partially independent. Since most subjects report their experiences as either a memory, a perception, or their imagination, it is often assumed that there are indeed such separate modalities of input. Many experimental reports, however, are consistent with the assumption that experience is not so segregated.

Functional Similarity vs. Process Similarity of Imaging to Perceiving

Sheehan's dissertation research (1965) also focused on the distinction between perception and imagery. Early in his analysis, Sheehan distinguished between the "functional similarity" of imaging and perceiving and their "process similarity". Functional similarity refers only to a correspondence in sets of behaviors, whatever the reason for that correspondence, as when a subject gives the same description of an image as he would give of a stimulus whereas process similarity asserts that imaging and perceiving are like processes. Sheehan attempted to demonstrate that data such as Perky's only indicate

functional similarity and that careless reasoning led Perky to the conclusion that process similarity was demonstrated.

In one series of experiments, Sheehan (1966b) evaluated the functional similarity of these two processes by relating behavior in an imagery and recall situation with behavior in a perceptual situation. The aim of these experiments was two-fold: (1) to find out whether a previously perceived stimulus pattern could be reproduced more accurately under instructions to image the original percept than under instructions to recall it; (2) to investigate some of the differential consequences of possessing weak and vivid imagery. The stimuli were geometrical figures reproducible by combining blocks into patterns. Stimulus patterns of varying complexity were used, but it was always found that the reconstructions were more accurate under the image condition than under recall. Individual differences in rated vividness of imagery were assessed by Sheehan's (1967a, 1967b) modification of Betts' Questionnaire upon Mental Imagery. Vivid imagers were almost always more accurate than weak imagers in their reproductions of the stimulus situation whereas the latter might be accurate or inaccurate.

In a second series of experiments, Sheehan (1966a) specifically tried to compare imagery and perception. An apparatus was constructed which enabled the brightness, clarity, and size of a simple geometric design to be varied. The subject viewed a stimulus for 10 sec., then closed his eyes while the stimulus was removed. He was then given 35 sec. in which to produce and hold a memory-image of the stimulus, at the end of which time he opens his eyes and adjusts the controls so that

the stimulus pattern matches the memory-image of the original stimulus. In this experiment, the stimulus selected was generally smaller, dimmer, and more blurred than the original; this tendency was less marked with vivid imagers. As in the first series of experiments, subjects who were weak imagers showed a wide spread from the highly inaccurate to the highly accurate, while subjects who were vivid imagers tended to be uniformly accurate.

Sheehan concluded that similar mechanisms may underly the processes of imagery and perception but the close correspondence between imaging and perceptual behavior does not necessarily warrant this conclusion. He believes that the hypothesis of process similarity requires that the imagery response show aftereffects, illusions, and negative afterimages. His results are explained in terms of individual differences in modes of representation of experience: poor imagers may process their experience differently from vivid imagers, employing more symbolic levels of representation such as coding or organizing devices. When these are satisfactory, the poor imagers perform well but when they fail, these subjects are inferior to the vivid imagers. The vivid imager, on the other hand, is tied to the immediacy of his experience and builds his representation upon perceptual organization which records initial experience step by step.

More recently, Brooks (1967, 1968), Segal and Fusella (1970), and Atwood (1971) have demonstrated the close relation between imaging and perceiving, and thus provide credibility for a definition of imagery as a quasi-perceptual process.

All of these investigators were able to demonstrate modality-specific interference in mental activity: visual perception suffers when it is put in direct competition with visual imagery, while listening and speaking suffer from competition with auditory/verbal imagery.

Brooks (1967, 1968) devised both spatial (visual) and verbal (auditory) tasks with responding in both the visual and verbal modes. In one experiment (Brooks, 1967), subjects were presented with a series of messages which described spatial relations, some described a simple matrix and others were nonsense equivalents. Some of these messages were spoken to the subject and others were spoken at the same rate but were accompanied by the simultaneous exposure of a typewritten copy of the message. When the set of directions were given aurally on a tape recorder, subjects remembered the spatial directions better; but when the directions were given both aurally and visually, subjects did better in their recall of the nonsense material. Brooks suggested that this occurred because the task of reading made it harder to visualize the appropriate matrix, and good performance depended on imaging the correct spatial relations.

In another experiment (Brooks, 1968), subjects were shown a simple outline figure, like the block letter F, and told to remember what it looked like. After the F was removed from vision, they were asked to describe the succession of corner points that would be encountered as one moved around it, categorizing each point as top-bottom or not, or left-right or not. The other task required auditory imagery. The subject first

learned a simple sentence ("a bird in the hand is not in the bush") and then was asked to go through it mentally categorizing each word according to some dichotomy, either as noun or non-noun or as article or non-article. The heart of the experiment was in the use of several different methods of responding: both tasks could be performed by saying the sequence of yeses and noes or by pointing to yeses and noes that appeared in staggered position on a sheet of paper. The aim of the second method was to involve visual control processes. As in the previous experiment, subjects were slowest when both the imaging task and the response task depended on the same sensory channel. The pointing was much slower on the visual task, presumably because one cannot visualize an I at the same time one is finding specific locations on a printed page. With the sentences, subjects could respond much faster by pointing than if they had to say the sequence of yeses and noes.

Segal and Fusella (1970) tested the hypothesis that imagery involves activity in the specific sensory organs, i.e., specific activity in the optic tract during visual imaging, as well as some sources of central activity. The experiment used to evaluate this hypothesis required that subjects generate both visual and auditory images while distinguishing between visual signals, auditory signals, and no signals. It was assumed that if imagery produced a change in attitude, a central distraction effect, then visual and auditory imagery should both reduce sensitivity to the same extent. However, if the auditory image generates some local effects in the auditory nerves, and if specific optic changes are associated with a visual

image, then imagined sounds should interfere more with detection of auditory signals, and imagined pictures should interfere more with detection of visual signals. It was reliably demonstrated that during visual imagery, sensitivity for the visual signal was lower than sensitivity for the auditory signal, and during auditory imagery, sensitivity for the auditory signal was lower than sensitivity for the visual signal.

Moreover, these findings were corroborated in a later study (Segal and Fusella, 1971) which revealed that the visual image specifically interfered with detection of the visual signal, and imagery in five other non-visual sensory modes did not produce the same decrement in sensitivity for the visual signal.

Recently, Atwood (1971) has shown that similar modality conflicts can interfere with the use of visual imagery as a mnemonic device. Subjects were played a tape recording of 35 phrases, each designating an imaginary scene which the subject was instructed to visualize. Subjects in Group 1 were given the visual stimulus "1" or "2" one sec. after each phrase; they responded "2" if "1" was presented and "1" if "2" was presented. Subjects in Group 2 received the auditory stimulus "1" or "2" and responded as in the first group. Subjects in Group 3 received no interfering signals during the 4-5 sec. interval between the presentation of successive phrases. Immediately following presentation of the 35 phrases, all subjects were supplied with the first word of each phrase and asked to recall the last. Three other groups of subjects were played a tape recording of 21 phrases, each designating abstract but meaningful relationships which the subject was

instructed to contemplate. Subjects in Group 4 received the visual task described for Group 1. Similarly, Group 5 received the auditory task and Group 6 received no interfering signals. The two essential predictions were confirmed: first, the visual task interfered more with verbal learning by means of imagery than the auditory task and, secondly, the relative interfering effects of these tasks were reversed in a verbal learning task involving highly abstract materials. Atwood (1971) distinguished between a visual system which controls visual perception and visual imagination and a verbal/auditory system which controls auditory perception, auditory imagination, internal verbal representation and speech. He concluded that attention can be more easily divided between the two systems than within either one taken by itself.

The work of Singer and Antrobus on daydreaming also points to the reciprocity of function of daydreaming and perceiving. They developed a model in which both external and internal events are operated on by a common central cognitive unit (Antrobus et al., 1970; Singer, 1970). It is assumed that under most conditions external stimuli have a somewhat greater priority for processing by a central operator, but that the brain is nevertheless continuously producing internal stimulation.

Antrobus and co-workers (Antrobus, 1968; Antrobus, Singer, and Greenberg, 1966) were successful in demonstrating changes in the frequency of spontaneously occurring cognitive activity (daydreaming) as a function of the demands of the external situation. In all of these experiments, subjects were seated in a lightproof, sound-attenuated room and presented with a

visual or auditory signal detection task. At intervals, usually after each 15 sec. period, the subjects reported on any task-irrelevant thoughts or images that may have occurred during the preceding interval. In one experiment (Antrobus et al., 1966), auditory signals were presented at the rate of one per sec. or one tone every three sec. and subjects required to press a switch when the tone presented was a low tone, or in an alternative group of trials, when the tone was a high one. It was found that increasing the rate of signal presentation did reduce the number of reported task-irrelevant or stimulus-independent thoughts.

The effect of information rate on the production of stimulus-independent thought was examined more precisely in a subsequent study (Antrobus, 1968) where information rate was defined in terms of bits per sec. and stimulus-independent thought was defined in terms of a simple binary response at the end of each trial ("yes" or "no"). The results indicated that the relative frequency of the stimulus-independent thought response was a negative linear function of the rate of presenting auditory information. Antrobus interpreted this linear effect to mean that internally produced information and task information share at least some stages for information processing. What was both apparent and amazing to Antrobus et al. (1970) was that despite efforts to eliminate ongoing daydreaming by greatly increasing the speed of signals, forcing reliance on short-term memory, and penalizing subjects for detection errors, a considerable amount of stimulu-independent thought persisted.

Imagery as a Cognitive Skill

In the context of the "new" cognitive psychology, fantasy processes (dreams, daydreams, images) have been redefined. Stimulus-bound experiences ("reality") and non-object-bound experiences ("images") are not considered to be uniquely different events but rather are considered to differ only according to the relative contribution made by certain specifiable factors. This body of research has also demonstrated that, although fantasy may serve defensive ends and represent a retreat from reality, the experiences subsumed under the label hallucinatory are actually common experiences of everyday life (Singer and McCraven, 1961). Instructions to hear or see an object that is not actually present are effective in eliciting reports of seeing or hearing the object in all but a few subjects (Sheehan, 1967a). Other studies have failed to provide evidence of greater imaginative richness in schizophrenics (Rickers-Ovsiankina, 1964; Singer and Spohn, 1956).

Fantasy may be viewed as a dimension of experience available for development as a cognitive skill (Singer, 1966, 1970). The difference between the normal and the abnormal person is not the amount of attention given to inner sources of stimulation but rather the ability to recognize these experiences as subjective and to put them to a variety of adaptive uses (e.g., deal with unfinished business, gain perspective, change affective states). In very general terms, internal stimuli refer to such things as memories, images, thoughts, and feelings, while external stimuli refer to the immediate environ-

mental objects of sensation and perception. Inner experience is drawn from long-term memory and is independent of an immediately presented external stimulus (Singer, 1966). Attentiveness to endopsychic subjective experiences is frequently regarded as a developmentally inferior stage of cognition (e.g., primary process). Yet, it is never completely displaced by attention to external realistic experiences; it may be a potential source of strength.

Attentiveness to inner experience may facilitate reality testing. The ability to differentiate internal imagery and current perception, commonly called reality testing, is considered to be a basic index of personal adjustment. Conversely, the occurence of hallucinations or, more generally, confusion between internal and external sources of experience has usually been regarded as an ultimate criterion of psychopathology. It has been assumed that the normal person is dominated by objective stimuli of external reality while the abnormal or defective person is dominated by subjective internal representations. It has already been pointed out by the writer that this formulation lacks a supportive body of research. In addition, it implies that successful reality testing comes about through direct physical contact with the objects of the outer world or reliance on consensual validation. Meyer and Mstein (1970) have pointed out that this view of reality testing is a single pole theory in that there is only one focus for reality testing, that is the external world.

From the point of view of the person there are two major sources of stimulation: external reality and internal reality

(Rapaport, 1951, 1958). The person must constantly balance and integrate these two forces and neglects either one at a cost. Furthermore, not only is there an inner reality experience and an outer reality experience, but each of these must be subjected to reality testing. Both inner and outer criteria now become possible bases for the reality testing process. Excessive reliance on inner experience as the criteria for checking experience results in a discarding or distortion of external reality when it does not fit the inner reality. Similarly, pursuing external reality as the sole criterion for checking experience results in the neglect of inner reality. In both instances a valuable source of information for reality testing is disregarded. The reality testing process is bipolar reflecting a continuum where attention either to external or internal reality may be the basis for reality testing (Meyer and Ekstein, 1970).

Focus of the Present Study

In the present study, an attempt will be made to answer a question which was first posed by Galton (1883) but which has not yet been satisfactorily answered: What is the significance of individual differences in vividness of imagery? Today, an answer appears possible for two reasons. First, techniques are available which could permit a far more precise evaluation of the problem. Signal detection theory and methodology has had a revolutionary effect on psychophysics and perception and, as we have seen, has been applied with success to the study of imagery. Secondly, an answer to the question will be sought in a somewhat different area. Historically, it

was assumed that vividness of imagery should correlate with performance differences in spatial problem solving, remembering, etc.; however, nearly every attempt has been unsuccessful. The present study will examine the role of vividness of imagery in reality testing.

The basic hypothesis of this study is that an individual's responsiveness to inner sources of stimulation is a variable which bears considerable relevance to the reality testing process. An individual disposed to attending to inner experience (who is functioning adequately in the real world) can use both inner and outer criteria as possible bases for reality testing whereas the Low Inner-Acceptant individual is limited to outer criteria. Therefore, the High Inner-Acceptant individual will fare better in the reality testing process. Segal's (1970, 1971) program of research on the Perky phenomenon has demonstrated that under certain conditions "normal" college students will confuse an internally generated image with an externally presented signal. This procedure will provide a useful paradigm for studying some of the variables that may influence the ability to discriminate between reality and imagery. This study will attempt to relate individual differences in attentiveness to internal sources of stimulation (inner-acceptance) and categories of imagery (childhood-recent; vivid-non-vivid; effortful-spontaneous) to reality testing (performance in the Perky task).

The measures of reality testing employed in this study are considerably narrower than the concept of reality testing as a principle in clinical theory and practice. The concept initially was defined as the capacity to judge the source of

perception with reference to whether it came from within or without (Freud, 1911). Further refinement of this definition led to the concept of reality testing as a process wherein the individual checked his perception and thoughts to determine the appropriateness of his thoughts or actions and of the inferences he made from his perceptions (Horowitz, 1970). The relationship between the operational measure of reality testing employed in this study and the clinical concept of reality testing is an important consideration and will be discussed at greater length in the final chapter of this thesis.

The first issue of the current study is the question of individual differences. If attention to internally generated experience is a cognitive skill which has adaptive significance, would not individuals who are more aware of their inner experience exhibit less blocking of visual signals by imagery than a corresponding group of individuals who are less attuned to their inner experiences? The available literature suggests that individuals who are less familiar with their inner experiences are the ones more likely to experience hallucinations. Solomon and Mendelson (1962), for example, reported an inverse relationship between predisposition to daydreaming and reports of perceptual isolation imagery. In another study (Seitz and Molholm, 1947), it was found that schizophrenics with auditory hallucinations manifested lower amounts of auditory imagery than either normal subjects or schizophrenic patients without auditory hallucinations.

It is assumed that the images produced by Low Inner-Acceptant subjects are more like perceptual constructions

than the images produced by High Inner-Acceptant subjects. The distinction between what is inner and what is outer is not as clear for the Low Inner-Acceptant subject as for the High Inner-Acceptant subject. In an imaging task, the Low Inner-Acceptant subject is required to behave contrary to his long standing personal disposition; he is unaccustomed to the experience of imaging. As a consequence of this high priority assigned to external channels of stimulation, the Low Inner-Acceptant subject is more likely to employ peripheral mechanisms in the process of conjuring an image. When instructed to image items and concurrently discriminate signals, the Low Inner-Acceptant subject is more likely to use aspects of the signal for image formation and miss detecting the signal. Just as the Low Inner-Acceptant subject is more likely to attribute external causation to a cognitive experience when interacting with the external world, he is also more likely to attribute internal causation to a cognitive experience in the course of looking inward. He is unable to use at once inner and outer criteria as possible bases for reality testing.

The High Inner-Acceptant subject, on the other hand, has access to both inner and outer criteria as possible bases for reality testing. Whether he is in contact with the external world or his inner experience, any cognitive event is processed by both inner and outer criteria and is not prejudicially allocated to an external or internal stimulus source. It is thought that images produced by an internally sensitive subject occur spontaneously and in finished form so that they would be less likely to include sensory elements and peripheral mechanisms.

As a result, the signal is available for accurate detection.

The second issue of the study centers on the effects of different categories of imagery. Images vary in many ways, including information about contents, vividness, clarity, color, shading, shapes, movement, foreground and background characteristics, and other spatial relationships. In this study, subjects will be asked to visualize items which they experienced in their childhood ("childhood memories") as well as items from recent perceptual experience ("recent memories"). Also, the subject will be required to rate each image for vividness on the Betts Rating Scale. Finally, the experimenter will record for each image the latency of image formation- the amount of time between the experimenter's instruction to image and the subject's response that he "has" the image. The notion that perception and image formation are similar processes both dependent upon some form of neural activity and some central expectancies and memories suggests that childhood memory images would block perception more than recent memory images, vivid images would block perception more than non-vivid images, and effortful images would block perception more than spontaneous images. If an image mimics a perception by employing the same peripheral and central mechanisms and if a vivid image is more like a perception than a non-vivid image, would not a vivid image block perception more than a non-vivid image? An internally generated image is generally smaller, dimmer, and more blurred than a perceptual image (Sheehan, 1966a). An internal image which is experienced intensely, as if it were localized externally, would be expected

to employ more perceptual elements and thereby reduce sensory sensitivity. Would not a childhood memory image which requires more neural and central activity block perception more than a recent memory image? Since childhood memories were stored as new material in the distant past, it is assumed that they would require more stages for information processing and therefore would interfere with perception to a greater extent than recent memories. Would not an effortful image which requires more concentration to summon up and is more likely to incorporate stray sensory elements block perception more than a spontaneous image?

The third main issue of this study deals with the interaction between each of the categories of imagery and the personality dimension of inner-acceptance. If the Low Inner-Acceptant subject is a person who is less in touch with his inner life and is not accustomed to the experience of imagery, would he not exhibit greater blocking of visual signals by vivid images than by non-vivid images and also greater blocking by childhood than by recent memory images? If the High Inner-Acceptant subject is a person who is more open to his inner experiences, would he not exhibit a comparable amount of blocking by vivid images and non-vivid images and also an equal amount of blocking with childhood memory and recent memory images? It is assumed that the experience of a vivid image (as compared to the experience of a non-vivid image) is relatively more unfamiliar and ambiguous to the Low Inner-Acceptant subject than to the High Inner-Acceptant subject. Similarly, the experience of a childhood memory image (as compared to the experience of a

recent memory image) is potentially more confusing to the Low Inner-Acceptant subject than to the High Inner-Acceptant subject. With respect to the distinction between effortful images and spontaneous images, it is assumed that all subjects will exhibit greater interference with perception by effortful images than by spontaneous images.

In summary, the following hypotheses will be evaluated in this study:

(1) Sensitivity (d') will be lower during imaging than during non-imaging detection tasks (first discrimination or interspersed discrimination).

(2) Sensitivity (d') during imaging (or any category of imagery) will be lower for Low Inner-Acceptant subjects than for High Inner-Acceptant subjects.

(3) (a) Sensitivity (d') within the imaging task will be lower for vivid than for non-vivid images.

(b) Sensitivity (d') within the imaging task will be lower for childhood memory than for recent memory images.

(c) Sensitivity (d') within the imaging task will be lower for effortful than for spontaneous images.

(4) (a) The difference in sensitivity (d') for vivid and non-vivid images will be greater for Low Inner-Acceptant subjects than for High Inner-Acceptant subjects. However, for both groups of subjects d' will be lower for vivid than for non-vivid images

(b) The difference in sensitivity (d') for childhood memory and recent memory images will be greater for Low Inner-Acceptant subjects than for High Inner-Acceptant subjects. However, for both groups of subjects d' will be lower for childhood than for recent memory images.

CHAPTER II

METHOD

Subjects

Three paper-and-pencil measures of inner-acceptance were administered to an initial group of 237 (134 males and 113 females) undergraduates enrolled in Introductory Psychology at The City College of New York. From this group and on the basis of extreme scores, 12 students were selected who could be categorized as High Inner-Acceptant and another 12 students were selected who could be categorized as Low Inner-Acceptant. The High Inner-Acceptant subjects were selected on the basis of their scoring in the top fifth of the distributions on at least two measures and no less than the second fifth of the distribution on the third measure of inner-acceptance. Low Inner-Acceptant subjects were those who scored in the bottom fifth of the distributions on at least two measures and no more than the fourth fifth of the distribution on the third measure of inner-acceptance.

These groups do not contain all of the subjects who met the criteria. Selection depended upon the relative cooperativeness and availability of subjects for individual sessions. The High Inner-Acceptant group consisted of 9 males and 3 females who ranged in age from 18 to 24 with a mean of 19.7. The Low Inner-Acceptant group consisted of 12 males who

ranged in age from 18 to 24 with a mean of 19.3. These 24 students agreed to serve as paid subjects in the two sessions required.

Measures of Inner-Acceptance

Schonbar (1965) delineated two generalized personality configurations or "life styles" which are distinguished in terms of their attentiveness to impinging internal classes of stimuli. Components of the High Inner-Acceptant life style include a high frequency of dream recall and of daydreaming, vivid imagery, and the use of sensitizing defenses. The Low Inner-Acceptant life style is in many ways the obverse of this, and is exhibited by a low frequency of dream recall and of daydreaming, weak imagery, and the use of repression as a defense. Three self-report questionnaires to be described below were selected in order to measure these different aspects of inner-acceptance (daydream frequency, vividness of imagery, and repression-sensitization).

The Repression-Sensitization Scale. The concept of repression-sensitization refers to a unidimensional categorization of defense mechanisms. At one end of this continuum of defensive behaviors are those responses which involve avoidance of the anxiety-arousing stimulus and its consequences (e.g., repression and denial). At the sensitizing extreme of the continuum are behaviors which involve an attempt to reduce anxiety by approaching or controlling the stimulus and its consequences (e.g., intellectualization and obsessive behaviors). The sensitizer tends to ruminate about the threat, verbalize its impact, and thereby neutralize its unpleasant implications.

The represser, in contrast, tends to deny the existence of a threatening stimulus and in doing so effectively blocks the aversive cognitions.

The Repression-Sensitization (R-S) Scale (Byrne, 1961; Byrne, Barry, and Nelson, 1963) was developed in accordance with this view (Appendix A). On the basis of prior work with the MMPI, three scales were selected as likely measures of sensitization (Depression, Psychasthenia, and Welsh Anxiety) and three others as measures of repression (Lie, Defensiveness, and Hysteria). The selection of these scales coincided with psychoanalytic conceptions of neurosis where the mechanism of repression is predominantly associated with hysteria while intellectualization is considered characteristic of the obsessive-compulsive neurosis. The result was a repression-sensitization scale consisting of 127 items. There is general agreement on the high reliability of the scale and considerable evidence to attest to its construct validity (Byrne, 1964). Repressers and sensitizers, as defined by this scale, have been found to differ in the predicted direction in terms of memory, perception, reported anxiety, and self-description.

Scores on the R-S Scale could range from 0 to 127 with higher scores indicating sensitization. In the present study, the mean for the sample was 45.10 and the standard deviation was 20.25. The mean High Inner-Acceptant score was 70.58 and the mean Low Inner-Acceptant score was 20.17.

The Shortened Form of the Betts Questionnaire upon Mental Imagery. Most measures of vividness of imagery have been based upon the original method introduced by Galton (1883). Of those

that followed, the most important have been the Betts (1909) questionnaire and the Sheehan (1967a) shortened form of this questionnaire. The Shortened Form of the Betts Questionnaire upon Mental Imagery (QMI) consists of 35 items, five from each of the seven sense modalities (visual, auditory, kinesthetic, cutaneous, gustatory, olfactory, and organic), which the respondent must image and then rate for vividness (Appendix A). He is asked, for example, to imagine seeing the sun as it is sinking below the horizon, hearing the whistle of a locomotive, drawing a circle on paper, touching fur, tasting oranges, smelling fresh paint, and feeling hunger, and to rate these images on the Betts Rating Scale (Appendix A). This requires him to compare the vividness of his image to the vividness of an actual percept. The scale ranges from 7 (no image present at all) through to 1 (perfectly clear and as vivid as the actual experience).

Extensive psychometric analyses (Sheehan, 1967a, 1967b) have provided evidence for the purity of the questionnaire as a measure of overall imagery vividness. In addition, a series of experiments by Sheehan (1966a, 1966b) himself have provided some indication of the utility of the measure. The aim of these experiments was to investigate the effects of possessing vivid or weak imagery on the ability to reproduce a previously perceived stimulus pattern. In general, he found that vividly imaging subjects, as defined by the Betts QMI, were almost always more accurate in the reproduction of a previously perceived stimulus pattern whereas weak imagers might be accurate or inaccurate.

Scores on the Betts QMI could range from 7 to 240 with lower scores indicating vivid imagery. In this study, the mean for the sample was 91.86 and the standard deviation was 25.93 The mean High Inner-Acceptant score was 68.50 and the mean Low Inner-Acceptant score was 118.67.

Positive-Vivid Daydreaming. In two separate factor analytic studies of The Imaginal Processes Inventory (Singer and Antrobus, 1963, 1972), four separate patterns or styles of daydreaming emerged fairly clearly: Anxious, Poorly Controlled Thought or Neurotic Absorption in Daydreaming; Obsessional Emotional Daydreaming; Positive-Vivid Daydreaming; and Controlled Thoughtfulness. The first two factors were interpreted as neurotic patterns of daydreaming (hysterical and obsessional, respectively) and the second two factors were viewed as styles of daydreaming applicable within the normal range.

The following scales contributed to the Positive-Vivid Daydreaming Factor: (1) Visual Imagery in Daydreams ("Visual scenes are an important part of my dreams"); (2) Absorption in Daydreaming ("I tend to get pretty wrapped up in my daydreaming"); (3) Auditory Imagery in Daydreaming ("The sounds I hear in my daydreams are clear and distinct"); (4) Positive Reaction in Daydreams ("My daydreams often leave me with a warm, happy feeling"); (5) Acceptance of Daydreaming ("The fewer daydreams one has the more time there is to really live"); (6) Daydreaming Frequency ("I daydream"). The items and scales which load on this factor suggest that high scorers are those who accept, enjoy, and use the internal environment. Accordingly, the 80 items which define this scale were combined and

used as the third measure of inner-acceptance (Appendix A).

Scores on the Positive-Vivid Daydreaming factor could range from 80 to 400 with higher scores indicating positive-vivid daydreaming. In the present study, the mean for the sample was 248.04 and the standard deviation was 42.86. The mean High Inner-Acceptant score was 309.42 and the mean Low Inner-Acceptant score was 196.50.

The Perky Paradigm: Measures of Reality Testing

Sensitivity (d') scores for external signals while imaging in the Perky task provided the measures of reality testing. Subjects were tested individually for the Perky effect in two separate sessions.

Apparatus. Each subject was seated in a chair and his face placed comfortably within the open end of a partially translucent cylinder, 35 cm. in length. His gaze was limited by the sides of the cylinder and focused on the 20 cm. screen at the end. The visual signal was a pattern of nine red dots, 4 larger and 5 smaller, placed randomly in a circular array. It was projected onto the back of the screen from a small Minolta 16 projector. The screen subtended a visual angle of about 19°, the signal at its widest point, 7°. The lamp in the projector was attenuated by a Powerstat voltmeter. A silent solid state interval timer (Marietta) was used; and at a manual signal, it activated the projector on for 2 sec.

Procedure. Each subject was tested individually. At the start of the first session, he was told:

> In this experiment we are going to measure your ability to detect signals, that is, to report on the presence or absence of a colored figure. You will be seated in the experimental chair with a hood that limits your field of

vision. You will be given many trials and asked on each trial whether the figure was present or not.

To begin with we will give you some practice trials. They will familiarize you with the routine and permit us to find the appropriate level for setting the brightness of the figure. We will deliberately set the intensity at a level where it is difficult for you to make the discrimination. On each trial, you will be given a ready signal. I will say "ready". The ready signal will be followed by an observation interval. Conclusion of the observation interval will be signified by my asking you "was anything present?". You may reply "yes" or "no" indicating whether you think the figure was present or absent. The signal will be present and absent equally often.

At least 40 or 50 practice trials were held, and the intensity of the signal was systematically varied until a level was found at which the subject made about 20% errors. Each trial lasted 5 sec. and contained a visual signal or no signal, presented in random order. The practice period was prolonged, if necessary, until the appropriate intensity level was found. The subject's sensitivity for this signal was then measured over 100 discrimination trials, which followed the same procedure as the practice trials. Intensity was maintained at this level for the remainder of the session.

Next, the subject was given the following instructions about imagery:

Now we will go into the regular testing procedure. Some of the time you will only be asked to detect the signals as you have been doing. Some of the time you will also be asked to imagine common items. Let us pause for a minute to explain what is meant by imagery. Images are mental pictures, usually of things you have seen, sometimes of things you would like to see.

Let me ask you a question: How many drawers are there in your bureau?. . . How did you arrive at the answer?. . . This is what we mean by an image. It is a common experience which you have had many times before when you're trying to remember a specific face or place. During the experiment you will be asked to imagine various specific objects. Sometimes I will ask for a childhood memory,

such as, "get a childhood memory of a bureau". Sometimes I will ask for a recent memory, such as, "get a recent memory of a bureau". If you are asked to imagine an item from childhood, then try to imagine an item which you experienced in your childhood but not later. By childhood I mean under the age of 12. If you are asked to imagine an item from recent memory, then try to imagine an object which you experienced in the last six months but not earlier. However, do not imagine objects which were experienced in the last 24 hours. It seems that memory for such recently perceived material is something quite different. It is sometimes difficult to make the distinction between childhood memory and recent memory but try your best. Avoid imagining objects which exhibit continuity over time and thus belong to both childhood and recent memory. Try to imagine objects which are specifically either from childhood or recent experience.

You will not be asked to report on your image as we find it is easier for people to concentrate on their imagery when they remain silent. You will also be asked to detect the signals. The procedure will be as follows: you will be asked to get, for example, a childhood memory of a bureau. You will indicate by raising a hand when you "have" the image. Shortly afterward, I will ask you if a signal was present. Please reply just as before, "yes" or "no", if you think the figure was present or absent.

When a signal is present, it will be presented at the same time as you are experiencing your image. But please focus on your image, as it is important that you have a clear impression of the item being imagined. You will also be asked to rate your image for vividness on a 7-point scale. Rating 1 signifies that the image was perfectly clear and as vivid as the actual experience; rating 2 means that the image was very clear and comparable in vividness to the actual experience; rating 3 refers to a moderately clear and vivid image. If your image is not clear or vivid, but recognizable, then rate it 4. A vague and dim image should be rated 5. If your image is so vague and dim as to be hardly discernible, then rate it 6. If no image was present at all, you only "knowing" that you are thinking of the object, then rate it 7. Throughout the procedure refer to the rating scale (a copy was placed in each subject's lap) when judging the vividness of each image. Try to make each rating on its own merits without reference to what has gone before.

Some of the time, I will ask you to imagine something; some of the time, I will merely say "ready". If I say "ready", that means you are simply to look at the screen and determine if the figure is present or not. If I say "get a childhood memory of something" or "get a recent memory of something", please signal with a hand raise

when you have the image. Continue to imagine your image, until I ask you if anything was present.

Is that clear?

There were 400 trials, 200 discrimination only, 200 with imagery (Appendix B). On each of the discrimination trials, the experimenter gave a "ready" sign, then either the visual signal or no signal was presented, and finally the subject decided if the signal had been presented. On each of the imagery trials, the subject raised his hand when he "had" the image requested; and as soon as he raised his hand, either the visual signal or no signal was presented. One half of the imagery trials were childhood memory trials: the experimenter instructed the subject to get a specific childhood memory (e.g., teacher). The other half of the imagery trials were recent memory trials: the experimenter instructed the subject to get a specific recent memory (e.g., teacher). About 5 sec. after he raised his hand, he was asked to report if the signal had been present. The three kinds of trials were presented in random order and within each condition, half of the trials were accompanied by a signal and half by no signal. The same random order was used for all subjects (See Appendix B).

Each item to be imaged was requested twice, once as a childhood memory and once as a recent memory. Items which are familiar and frequent in occurrence were selected for inclusion in the list (Appendix B). On each of the imagery trials, the subject was also required to rate his image for vividness according to the Betts Rating Scale (Appendix A). He did this verbally following his report whether the signal was present. On each of the imagery trials, the experimenter also recorded

by means of a stopwatch the latency of image formation. The stopwatch was activated immediately after the instruction to image was given and was stopped when the subject raised his hand indicating that he "had" the image.

The second session followed the same design except that the instructions were abbreviated and the 400 trials were presented in a different randomized order.

Overall Procedure

A composite inventory (Appendix A) consisting of the R-S Scale, the Positive-Vivid Daydreaming Factor, and the Shortened Form of the Betts QMI (in that order) was administered to students in 14 recitation sections of Introductory Psychology at The City College of New York.

Names and telephone numbers of subjects who could be categorized as High Inner-Acceptant or Low Inner-Acceptant were given to the experimenter. Twenty-four of these subjects (12 High Inner-Acceptant and 12 Low Inner-Acceptant) participated in the second part of the study, which consisted of two separate sections during which the Perky task was administered. Individual appointments were made with these subjects and the two sessions were separated by about one week. The participants had no prior knowledge about the purpose of this part of the experiment except for the fact that it was part of the same study. It was explained to each subject that the focus of the study was not individual's personalities but rather basic processes (e.g., signal detection) and that he was selected on a purely random basis. Thus, the experimenter and the subject did not know at the time of testing whether the latter was High Inner-Acceptant or Low Inner-Acceptant.

CHAPTER III

RESULTS

Signal detection measures (*d'* and *Lx*) were derived from hit and false alarm frequencies (Freeman, 1964). In order to evaluate the experimental hypotheses, sensitivity (*d'*) and criterion (*Lx*) scores were obtained for each of the discrimination and imaging conditions: first discrimination, interspersed discrimination, total imagery, childhood memory, recent memory, vivid imagery, non-vivid imagery, spontaneous imagery, and effortful imagery. This was done for the entire group of subjects combined as well as for the subgroups, High Inner-Acceptant and Low Inner-Acceptant, separately.

As in previous work (Segal and Fusella, 1970, 1971; Segal and Gordon, 1969), imagery clearly interfered with detection of the signal: *d'* was lower in the imaging task than in either discrimination task. This was obtained for the group (Table 1) and for the subgroups, High Inner-Acceptant (Table 2) and Low Inner-Acceptant (Table 3), separately. For the group, *d'* scores were 3.720 for first discrimination, 3.129 for interspersed discrimination, and 2.517 for imaging. For the High Inner-Acceptant subgroup, *d'* scores were 3.589 for first discrimination, 3.066 for interspersed discrimination, and 2.247 for imaging. For the Low Inner-Acceptant subgroup, *d'* scores were 3.720 for first discrimination, 3.235 for interspersed

TABLE 1

Hit and False Alarm Rates,

d' and Lx Values,

for Discrimination and Imaging Tasks

Group

	Hit/F.A.	d'	Lx
Discrimination			
First	.80/.002	3.720	44.157
Interspersed	.71/.005	3.129	23.673
Imaging			
Total	.56/.009	2.517	16.227
Childhood	.55/.008	2.535	18.057
Recent	.56/.010	2.477	14.799
Vivid	.55/.009	2.491	16.284
Non-vivid	.56/.009	2.517	16.227
Spontaneous	.57/.009	2.542	16.160
Effortful	.54/.008	2.509	18.109

Summary of G Scores

	G	p
Imaging vs.:		
First discrimination	7.59	.001
Interspersed discrimination	6.53	.001
First vs. Interspersed discrimination	3.60	.001
Childhood vs. Recent	.49	ns
Vivid vs. Non-vivid	.21	ns
Effortful vs. Spontaneous	.27	ns

TABLE 2

Hit and False Alarm Rates,

d' and Lx Values,

for Discrimination and Imaging Tasks

High Inner-Acceptant Group

	Hit/F.A.	d'	Lx
Discrimination			
First	.80/.003	3.589	30.600
Interspersed	.71/.006	3.066	20.132
Imaging			
Total	.52/.014	2.247	11.165
Childhood	.52/.012	2.307	12.757
Recent	.53/.016	2.220	9.938
Vivid	.53/.015	2.247	10.543
Non-vivid	.51/.011	2.317	13.817
Spontaneous	.54/.014	2.298	11.123
Effortful	.50/.013	2.224	11.475

Summary of G Scores

	G	p
Imaging vs.:		
First discrimination	6.98	.001
Interspersed discrimination	6.80	.001
First vs. Interspersed discrimination	2.58	.01
Childhood vs. Recent	.60	ns
Vivid vs. Non-vivid	.45	ns
Effortful vs. Spontaneous	.50	ns

TABLE 3

Hit and False Alarm Rates,

d' and Lx Values,

for Discrimination and Imaging Tasks

Low Inner-Acceptant Group

	Hit/F.A.	d'	Lx
Discrimination			
First	.80/.002	3.720	44.157
Interspersed	.72/.004	3.235	28.414
Imaging			
Total	.59/.004	2.880	32.814
Childhood	.59/.004	2.880	32.814
Recent	.59/.003	2.950	42.724
Vivid	.57/.001	3.267	116.654
Non-vivid	.61/.007	2.737	19.869
Spontaneous	.61/.004	2.931	32.986
Effortful	.56/.003	2.899	43.110

Summary of G Scores

	G	p
Imaging vs.:		
First discrimination	3.56	.001
Interspersed discrimination	3.25	.01
First vs. Interspersed discrimination	2.05	.05
Childhood vs. Recent	.30	ns
Vivid vs. Non-vivid	1.86	.07
Effortful vs. Spontaneous	.14	ns

discrimination, and 2.880 for imaging. Gourevitch and Galanter's (1967) G test was used to evaluate the significance of the difference between two d' scores. The d' in the imaging task was significantly lower than d' values in the first discrimination and interspersed discrimination. Again, this was obtained for the group (Table 1) and for the subgroups, High Inner-Acceptant (Table 2) and Low Inner-Acceptant (Table 3), separately.

Within the discrimination tasks, d' was lower in the interspersed discrimination than in the first discrimination. This difference was significant for the group ($G=3.60$, $p<.001$), and for the subgroups, High Inner-Acceptant ($G=2.58$, $p<.01$) and Low Inner-Acceptant ($G=2.05$, $p<.05$), separately.

The blocking effect of imagery on perception was greater for High Inner-Acceptant subjects than for Low Inner-Acceptant subjects. Thus, the hypothesis which predicted that imagery would have a greater blocking effect for Low Inner-Acceptant subjects was not only not confirmed but the outcome was reversed. High Inner-Acceptant and Low Inner-Acceptant subgroups did not differ with respect to d' scores during first discrimination or interspersed discrimination (Table 4). However, these two extreme groups did differ with respect to d' scores during imagery: sensitivity (d') during imagery was significantly lower for High Inner-Acceptant than for Low Inner-Acceptant subjects ($G=4.77$, $p<.001$). Furthermore, d' during any category of imagery was smaller for High Inner-Acceptant subjects than for Low Inner-Acceptant subjects (Table 4).

TABLE 4

Summary of G Scores for

High Inner-Acceptant- -Low Inner-Acceptant Comparisons

	High Inner-Acceptant d'	Low Inner-Acceptant d'	G	p
Discrimination				
First	3.589	3.720	.48	ns
Interspersed	3.066	3.235	1.15	ns
Imaging				
Total	2.247	2.880	4.77	.001
Childhood	2.307	2.880	3.01	.01
Recent	2.220	2.950	3.61	.001
Vivid	2.247	3.267	3.73	.001
Non-vivid	2.317	2.737	2.22	.05
Spontaneous	2.298	2.931	3.36	.001
Effortful	2.224	2.899	3.28	.01

High Inner-Acceptant subjects reported more vivid imagery and their images were formed more spontaneously than Low Inner-Acceptant subjects. The relationship between inner-acceptance and vividness of imagery was significant (χ^2=1531.39, df=6, $p<.001$, ϕ=.40); the relationship between inner-acceptance and latency of image formation was also significant (χ^2=18.73, df=1, $p<.001$, ϕ=.04).

In order to evaluate the effects of vividness, d' scores during vivid imagery were compared to d' during non-vivid imagery. For High Inner-Acceptant subjects, images rated 1 and 2 on the Betts Rating Scale were compared to images rated 3, 4, 5, 6, and 7. For Low Inner-Acceptant subjects, images rated 1, 2, and 3 were compared to images rated 4, 5, 6, and 7. For the group, images rated 1 and 2 by High Inner-Acceptant subjects were combined with images rated 1, 2, and 3 by Low Inner-Acceptant subjects and these were compared to the total of images rated 3, 4, 5, 6, and 7 by High Inner-Acceptant subjects and images rated 4, 5, 6, and 7 by Low Inner-Acceptant subjects. These methods of classification were employed in order to obtain an equitable distribution of instances in the vivid and non-vivid categories.

The predicted relationship between vividness of imagery and d' scores was not obtained: d' values were not significantly smaller during vivid imagery than during non-vivid imagery. For the group (Table 1), the difference in d' scores between vivid and non-vivid imagery was in the predicted direction but was not significant. For the High Inner-Acceptant subjects (Table 2), this difference was also in the

predicted direction but again was not significant. For the Low Inner-Acceptant subjects (Table 3), the direction of the relationship was reversed, with non-vivid imagery interfering more with signal detection than vivid imagery, and was close to significance ($\underline{z}$=1.86, $\underline{p}$<.07). Thus the hypothesis which suggested a larger difference in $\underline{d}'$ scores between vivid and non-vivid imagery for Low Inner-Acceptant subjects was not supported, since the direction of the obtained difference was not expected.

In order to evaluate the effects of effortfulness, $\underline{d}'$ scores during images associated with short latencies were compared to $\underline{d}'$ scores during images associated with long latencies. For each subject, images were ranked according to their latency and this distribution was divided at its median. Then images associated with short latencies were compared to images associated with long latencies for the group and the subgroups, High Inner-Acceptant and Low Inner-Acceptant, separately. The hypothesis that effortful images would be associated with a smaller $\underline{d}'$ than spontaneous images was not supported. For all three comparisons- -group (Table 1), High Inner-Acceptant (Table 2), and Low Inner-Acceptant (Table 3)- -the differences were in the predicted direction but were not statistically significant.

The hypothesis that images of items perceived in childhood would have a greater interfering effect on signal detection than images of recently perceived material was examined by comparing $\underline{d}'$ scores under instructions to "get a childhood memory" with $\underline{d}'$ scores under instructions to "get a recent

memory". Comparisons of these two categories of imagery for the group (Table 1) and for the subgroups, High Inner-Acceptant (Table 2) and Low Inner-Acceptant (Table 3), yielded no significant differences. However, the obtained difference in each comparison was in the predicted direction. The hypothesis which suggested a larger difference in d' scores between childhood memory and recent memory for Low Inner-Acceptant subjects was not supported.

The interrelatedness of the three categories of imagery- - childhood-recent, vivid-non-vivid, and effortful-spontaneous- - was examined. For all subjects, images of recently perceived material were more vivid (χ^2=1093.85, df=6, $p<.001$, ϕ=.34) and were formed more spontaneously (χ^2=170.68, df=1, $p<.001$, ϕ=.13). These relationships were confirmed for the subgroups, High Inner-Acceptant and Low Inner-Acceptant, separately. For the High Inner-Acceptant subjects, images of recently perceived material were more vivid (χ^2=593.24, df=6, $p<.001$, ϕ=.35) and were formed more spontaneously (χ^2=82.70, df=1, $p<.001$, ϕ=.13). For the Low Inner-Acceptant subjects, images of recently perceived material were more vivid (χ^2=705.37, df=6, $p<.001$, ϕ=.39) and were formed more spontaneously (χ^2=82.17, df=1, $p<.001$, ϕ=.13).

CHAPTER IV

DISCUSSION

The Perky Effect: Blocking of an External Signal by Mental Imagery

The results, in general, provide support for the conceptualization of imagery as a quasi-perceptual process. This is that both the percept and the image involve the sensory pathways; both are similar sensory-cognitive events which cannot always be distinguished. Sensitivity (d') was poorer during imaging than either first discrimination or interspersed discrimination. Thus, the image has certain specific sensory effects, which intervene between the subject and the signal, lowering his basic sensitivity for the signal; these sensory effects may be so similar to the effects of a signal, that they are confused with the latter.

The adverse effect of imagery on perception has been demonstrated many times and the main findings have been repeatedly verified: sensory sensitivity for the physical signal, as measured by the d' statistic, was always significantly worse during the imaging trials than in a standard discrimination task (Segal, 1970, 1971). The present replication extends previous findings by controlling for the possibility that imagery provides a random or generalized distraction effect. It seemed possible that the reason sensitivity was always

better during discrimination than in imaging trials was that the image distracted the observer: because he was thinking about the image, he had less attention available and sometimes failed to notice the signal. In previous research (Segal and Fusella, 1970, 1971), sensitivity may have been better during discrimination than in imaging trials because the imaging trials were given separately. In the discrimination sessions, the subject's only task was to detect signals. Maximum alertness, attentiveness, and therefore, maximum accuracy was possible under these conditions. During the imaging session, on the contrary, the subject never knew what image he would be asked for; when the image was constructed, he raised his hand to indicate that he "had" an image, and then the signal was shown. Perhaps it was partly the effect of this uncertainty in the imaging task and not the act of imaging itself which caused the sensitivity to be lower.

In the present experiment, discrimination trials were randomly interspersed among imaging trials, so the subject would not know whether he would be asked to detect a signal with no imagery, with a childhood memory, or with a recent memory, until the specific instructions for the trial were given. In this condition, the subject's attention is divided or distracted on the discrimination as well as on the imaging trials. The d' values for non-imaging discrimination, when interspersed among imaging trials, were much poorer than for non-imaging trials in a separate uniform discrimination session (first discrimination). This difference was large and signif-

icant for the group (Table 1) and the subgroups, High Inner-Acceptant (Table 2) and Low Inner-Acceptant (Table 3), separately.

However, sensitivity for the visual signal was significantly worse when subjects were imaging than in either non-imaging discrimination, when interspersed among imaging trials, or non-imaging trials in a separate uniform discrimination session. This was obtained for the group (Table 1) and the subgroups, High Inner-Acceptant (Table 2) and Low Inner-Acceptant (Table 3), separately. These data suggest that both attentional factors and sensory effects of the image must be hypothesized to explain the blocking effect of imagery on perception. When a subject is simultaneously imaging and detecting a signal, there may be some central distraction effects. However, with these distraction effects equalized, imagery continues to interfere with signal detection.

Triesman's model (1969) of selective attention seems directly applicable to this finding. Triesman reported that a subject, engaged in a dichotic listening task, generally missed a target word piped into the "nonattended" ear (Triesman and Geffen, 1967); in the same way, it could be that the subject who is imaging could "miss" a signal presented before his gaze. According to Triesman's model (1969), the central operator first "decides" which sensory input to analyze. That is, it may be especially set to attend to auditory input; and within that channel, especially sensitive to input from the right ear. If it is attending to input from the right ear, then that input is processed quite completely for content, whereas input coming through other channels is monitored less

adequately. A graded series of analyzers was hypothesized by Triesman, arranged so that input from the nonattended ear was processed for peripheral qualities, e.g., male or female speaker, but not for content, whereas input from the attended ear was fully processed for content.

In order to apply Triesman's model to the present finding, one additional assumption must be made, namely, that the image is treated as sensory input by the attentional system. That is, the operator "decides" to analyze visual input, and within that channel, is especially attentive to events of internal origin. In order to construct a complete and "visible" image, it must be analyzed for shape, color, size, location, and content, just as a visual signal is analyzed. If these analyzers are occupied in delineating a visual image, then concurrent visual input is less adequately processed and sensitivity (*d'*) is lower. There also seems to be some general influence of central attention, which may explain the fact that there is some decrement in sensitivity for the visual signal during interspersed discrimination trials.

Individual Differences in Inner-Acceptance

The results concerning the effects of individual differences suggest that a relationship does exist between the attentional priorities one assigns to internally produced stimuli and the blocking effect of imagery on perception. If seeing and imagining employ similar mechanisms for information processing, then greater absorption in the inner created image should lead to greater blocking of the signal. This is exactly what occurred: during imagery, sensitivity (*d'*) for the signal was lower for

High Inner-Acceptant subjects than for Lower Inner-Acceptant subjects. Subjects who are especially vivid imagers have a "noisier" imaging process, and therefore have a more difficult task differentiating between signal plus noise and noise alone in the imaging condition, as compared to weak imagers. In this connection, it is especially relevant that High Inner-Acceptant subjects reported more vivid imagery and their images developed more spontaneously, as compared to Low Inner-Acceptant subjects.

A slightly different explanation for these results is in terms of individual differences in strategies of attention deployment. If the central executive operates with a kind of set to focus either on external material or on internal material with certain preestablished priorities, we can see the basis for individual differences in cognitive style within Friesman's model (1969) of selective attention. A distinction between attention to inner and external stimulation has been made by several authors (Rapaport, 1951, 1958; Schachtel, 1959; Singer, 1966). According to Schachtel (1959) acts of attending involve both lowering of the threshold to a certain range of stimuli and the raising of the threshold to another range of stimuli. Rapaport (1951, 1958), in his work on ego autonomy, made assumptions about the relationship between responsiveness to inner and outer stimuli. He considered the ego as able to achieve some measure of autonomy from both external and internal stimulation. Such autonomy was always relative since the ego was never completely insulated from either source of stimulation.

Paradoxically, the autonomy that is achieved depends on the ego's ties to the two major sources of stimulation. Its autonomy from internal forces derives from the apparatuses that are responsive to the external environment and its autonomy from the external environment comes from the ego's responsiveness to internal forces. According to Rapaport, there is a reciprocal relationship between the threshold to external stimulation and the threshold to internal stimulation. Raising the threshold to external stimulation tends to lower the threshold to internal stimulation and conversely, raising the threshold to inner stimulation tends to lower the threshold to external stimulation.

The findings obtained in the present study can be conceptualized in terms of a threshold model such as Rapaport's. The person's position on the inner-acceptance continuum can be considered a consequence of his characteristic "setting" of thresholds. This model would imply that the ego would be tuned to seek nutriment appropriate to certain ego structures and to ward off other forms of experience. The Low Inner-Acceptant person would be seen as having a low threshold to environmental stimulation and a higher threshold to stimulation from internal sources. He would need constant stimulation from without to avoid fantasy and to support his view of reality. The High Inner-Acceptant person, with his high threshold to external stimulation and lower threshold to inner forces, would hold off from vigorous and direct involvement with external reality and be more at home with his thoughts.

In the Perky task, when a subject is imaging and a signal may or may not be present, the subject's task is to construct an image and simultaneously make the detection decision. It is apparent that this is a task requiring broad deployment of attention, and focusing on one aspect or another might be detrimental. For a person to detect a stimulus while he is imaging, two processes must occur: first, he must construct his image, and second, he must code the sensory input as relating to an external source. It is quite possible for both to occur concurrently: the stimulus is present for 2 sec. and the image usually develops over 5 or more sec., and certainly it is easy to attend to two tasks within that time period. However, because of individual differences along the inner-acceptance dimension, some subjects emphasize the task of imaging and others emphasize the task of signal detection. In this study, the Low Inner-Acceptant subjects were more likely to process the signal as an event separate from his image due to his characteristic setting of thresholds, i.e., he was more likely to appreciate the precise task requirements and the unique qualities of the stimulus. The High Inner-Acceptant subject, on the other hand, was less likely to detect the presence of the signal due to his characteristic setting of thresholds, i.e., he was more likely to combine the sensory input with past memories into the construction of an image and, as a result, the sensory input was less available as a cue for signal detection.

In several earlier experiments (Segal and Glicksman, 1967; Segal and Nathan, 1964) individual differences among subjects

were found to have an effect on the Perky phenomenon. However, the present study was the first devoted primarily to the investigation of individual differences. The first experiment with the Perky effect (Segal and Nathan, 1964) was directed at the question whether the adverse effect of imagery on signal detection would be enhanced in more relaxed subjects. Experimental subjects were given a placebo which was supposed to be a "relaxant". Subjects who reacted to the placebo (subjects who reported being more relaxed) reported more imagery and had fewer perceptions than the control group, while the non-reactors had less imagery and more perceptions than the control group. In another study directed at the problem of relaxation (Segal and Glicksman, 1967), subjects' ability to detect a stimulus was compared under three body positions: sitting, standing, or supine lying. Subjects reported significantly more perceptions in the standing position, intermediate sitting, and fewest lying. Moreover, those subjects who appeared clinically relaxed showed this effect more strongly and it was essentially absent among the tenser subjects. Thus both these studies suggest that relaxation, by heightening the imagery or changing the characteristic setting of thresholds seems to mediate a more ambivalent experience, and thus leads to a stronger Perky effect, i.e., more incorrect attributions of the experience to an internal source.

An alternative explanation that could be offered to account for the results concerning individual differences is that a differential response bias existed for the two extreme groups. It is possible that Low Inner-Acceptant subjects did

not take the instructions seriously: if they did not perform an extensive memory search in order to construct the appropriate image, then they would have more channel space available for signal detection and therefore greater accuracy. In the present study, verbal descriptions of imagery were not obtained from subjects. This kind of data, in combination with drawings of the subjects' imagery, would be valuable in assessing the extent to which the images of Low Inner-Acceptant subjects were more cliche, stereotyped, or commonplace than the images of High Inner-Acceptant subjects. Although such data were not available, the finding that Low Inner-Acceptant subjects generally required more time to develop images argues against such an effect, but this alternative explanation cannot be entirely discarded.

The findings of the present study suggest that the High Inner-Acceptant subject is a person who places a relatively high priority on attending to material from long-term memory. The significant differences in accuracy of signal detection during imagery indicate that High Inner-Acceptant subjects were more willing to miss some signals in order to attend to their own ongoing imagery. Modern science has made it abundantly clear that the brain is continuously active, processing stimuli which impinge upon the sense organs and reprocessing stimuli which have been stored in long-term memory (Neisser, 1967). The findings described in this thesis reflect the role of individual style in assigning greater priority to processing internal material. Furthermore, they confirm the results of an earlier study (Antrobus, Coleman, and Singer, 1967) which

compared High Daydreamers and Low Daydreamers in an auditory signal detection task under sensory-restricted conditions. In that study, High Daydreamers reported a significantly greater number of task-irrelevant images or stimulus-independent thoughts and exhibited a slightly greater number of detection errors.

Broadbent's (1958) distinction between short and long sampling systems seems similar to the distinction between High and Low Inner-Acceptant subjects. In a long sampling system, emphasis is on reviewing and restructuring a good deal of internal material and new information is processed by relating it to stored material as well as to other externally presented material. In a short sampling system, new outside material is rapidly responded to with little time spent in matching and transforming. From this point of view, High Inner-Acceptant subjects are long samplers and are more likely to lose information from the external world. The findings obtained in the present study confirmed that High Inner-Acceptant subjects are less sensitive to external signals in a simultaneous imaging task. Whether loss of information from the external world is crucial for day to day life would depend upon the nature of the information lost. However, in ordinary life, many situations are so redundant in their information yield that it is unnecessary to respond to each situation as if it were presented for the first time. Responsiveness to inner experience may be put to a variety of uses or serve adaptive purposes. It is possible that the High Inner-Acceptant person has a more complex world, with a more differentiated set of constructs. He may be more adept in discriminating between significant and

insignificant changes in the environment. In general, he has available an additional dimension of experience which may be valuable in gaining perspective on a problem or in changing an affective state.

Reality Testing

Although the results concerning the role of individual differences are consistent with much of the research described in Chapter I, which points to the similarity of imagery and perception, they are not consistent with the experimental hypothesis. The hypothesis predicted that the Low Inner-Acceptant subjects would be less adversely affected by imagery. It was assumed that because High Inner-Acceptant subjects are more familiar with their inner experiences they would have a greater capacity for differentiating signal and image. It was further assumed that the experience of imagery by the Low Inner-Acceptant subject would be not only unfamiliar and ambiguous but potentially confusing. However, this view of imagery as a cognitive skill was not supported in this study where the Perky effect was used as a measure of reality testing. Reality testing is a concept which might be measured more appropriately in a dynamic situation where the switching of attention between inner and outer sources of stimulation is required. It seems that the Perky task provides a strict experimental measure of the degree of communality of imagery and perception, for those who report more imagery tend to exhibit greater blocking.

However, in an earlier experiment by Segal (1968), it was found that under certain circumstances "High Inner-Acceptant"

type subjects were more accurate in signal detection while imaging than "Low Inner-Acceptant" type subjects. This was an extensive experiment studying the effect of a drive state on judgements of need-related and neutral imagery. It was concluded that a particular individual difference measure interacted with the drive. Thirsty subjects seemed to confuse an image and stimulus more, reporting slightly fewer perceptions in the presence of stimuli and more false alarms when no stimuli were present. Further analysis of the data revealed that the group finding depended on the subjects characterized as "intolerant for ambiguity"; they showed a complete breakdown of judgement when they were thirsty and were quite accurate in the control condition. On the other hand, subjects characterized as "tolerant for ambiguity" adapted better to the drive state; they were more accurate when thirsty but less accurate in the control condition. This experiment suggests that it is possible to transform the Perky task into a more dynamic task by some form of experimental intervention.

The differentiation between internal images and current perception in the Perky task is a very special case of reality testing. Reality testing has great conceptual importance in clinical psychology and psychiatry and generally refers to the ability to judge other's intentions, motives, affects, etc. (Freud, 1911). Although this conception of reality testing is considerably broader than the measure of reality testing employed in the present study, the Perky technique is applicable to mental health problems. This line of research assumes that perception and imagery are essentially similar experiences;

a second basic assumption is that the distinction between perception and imagery, the reality testing function, is basically a probability function. On any given trial, the subject states that a signal is present or not. When he states that a signal is present incorrectly, it is called a false alarm; and the false alarm is related to hallucinations and pseudo-hallucinations. On some trials, a stimulus is present, but the subject "misses" it; such a situation is related to psychic blindness. Yet, in the present experiment, false alarms and misses are not exceptional events, as are hallucinations and psychic blindness. They occur with a probability which varies consistently and can be measured.

As indicated in the introduction, it is often assumed that the psychotic individual suffers from "failures in reality testing": hallucinations, delusions, fugues, and other bizarre states are extreme forms of an inability to draw a reasonable line between what is inner and what is outer. It is often thought that the ability to distinguish between reality and illusion consistently is one of the marks of a "normal" adult; infants, children, and neurotics confuse the two. Kris (1950) and Rapaport (1951) have, however, asserted that there may be some degree of fluidity between these boundaries in the creative adult. The present research tends to confirm the latter view, as it suggests that reality and non-reality cannot be distinguished all the time. Yet, in many real-life situations, the redundancies are so great and the signal-to-noise ratio is so large, that the distinction can be made almost perfectly. Experimental evidence on the conditions which enhance the

occurrence of false alarms or misses may suggest ways to analyze psychotic delusions as due to changes in the inner expectancies, changes in the way stimulus input is processed, or changes in the probability function that determines the decision. Likewise, such evidence may clarify the creative process, and what is actually meant by "regression in the service of the ego", or how the ego actually adjudicates between the demands of its inner life and the requirements of external reality. This line of research may lead to useful bridges between the insights of the clinician and findings of the experimental laboratory.

Categories of Imagery

The most difficult aspect of the study of imagery is an investigation of the actual image in the subject's mind; the technique described in this study attempts to circumvent this problem by analyzing the influence of that image on other measurable events (notably signal detection). It was anticipated that many aspects of the image could be investigated using this technique: for example, an image of an emotionally charged event may be contrasted with a neutral image; an image of a personal experience may be contrasted with a generalized concept, and so on. By comparing the blocking effects of these images on detection of a signal in the same modality, it seemed possible to obtain an indirect estimate of the degree of communality between the image and perception. In previous research, it was found that changes in sensory modality of imagery and variations in familiarity of the image have mediated stable changes in the d' (Segal and Fusella, 1970, 1971).

In the present study, no significant results were obtained on several important dimensions of imagery: childhood memory compared to recent memory, vivid imagery compared to non-vivid imagery, effortful imagery compared to spontaneous imagery. It is possible to conclude that childhood memory and recent memory represent similar sources of interference with perception and that this is also true of vivid and non-vivid imagery as well as effortful and spontaneous imagery. However, if such important differences in imagery as these cannot be measured, then this would represent a serious blow to this line of research.

An alternative explanation for the absence of significant differences between categories of imagery may lie in the instructions which were used in the present study. Subjects were not specifically told to "image" but rather to "get a childhood memory" or to "get a recent memory". In Segal and Fusella's (1970, 1971) earlier studies, subjects were specifically told to "imagine seeing", "imagine hearing", etc. This is not to say that subjects in the present study were not imaging but rather to suggest the possibility that they were not imaging as completely or fully as they might have. Instructions like "get a childhood memory" or "get a recent memory" might not be as effective in eliciting imagery experiences and might simply suggest recollection through whatever means possible. Although this issue cannot be resolved on the basis of present information, it seems likely that these results were not due to a mistaken communication, since subjects were given a lengthy introduction to the nature of imagery

and to the difference between memory and imagery.

In retrospect, it was not surprising that all three comparisons- -childhood-recent, vivid-non-vivid, effortful-spontaneous- -yielded insignificant findings. The results concerning the interrelatedness of these categories of imagery suggest that they are not separate varieties of imagery but similar dimensions. Intuitively, there seem to be differences between these three categories of imagery. Vividness and effortfulness are conceived as structural characteristics and recency as a substantive characteristic of imagery. Vividness refers to the intensity of an image in terms of its comparability to a perceptual experience and is similar to the distinction between bright and dim or between clear and vague. Effortfulness refers to the amount of concentration which is necessary in order to bring to mind an image. Recency concerns the content of an image: a recent memory is an image of an item which was experienced in the near past while a childhood memory is an image of an item which was experienced in the remote past.

The results, however, indicated a high degree of overlap between the childhood-recent categorization and both the vivid-non-vivid and spontaneous-effortful categorizations: recent memories were both significantly more vivid and significantly more spontaneous than childhood memories. Since the list of items to be imaged consisted largely of impersonal objects (e.g., wallet, refrigerator, bed), these may not have been reviewed since the original coding. From this perspective, the increased vividness and spontaneity of recent memories is

due to the possibility that the material requested of subjects was in the very process of original coding assigned to some low priority reprocessing cycle or gated out. As a result, items experienced in the distant past were probably so unfamiliar as to be imaged with great difficulty and little vividness. The absence of some difference in sensory sensitivity (d') suggests the possibility that subjects were virtually unable to summon images of objects experienced in childhood. Perhaps, what was imaged when the subject was asked to get a childhood memory was something only indirectly related to the specific instruction but more familiar. The longer latencies associated with childhood memories may be due to the greater amount of time required to summon an acceptable image under these instructions. The weaker vividness ratings associated with childhood memories may be because the subject judged the clarity of the item requested in the instruction and not the image which was actually entertained.

Except for one suggestive finding, the results concerning the interaction between inner-acceptance and each category of imagery were also generally negative. It was assumed that the difference in sensitivity (d') for vivid and non-vivid images would be greater for Low Inner-Acceptant subjects than for High Inner-Acceptant subjects. The difference between these two d' scores was indeed negligible and insignificant for High Inner-Acceptant subjects. The Low Inner-Acceptant subjects, on the other hand, were more accurate during vivid imagery than during non-vivid imagery and this difference approached significance. This finding, taken together with the

finding that Low Inner-Acceptant subjects are generally more accurate in signal detection during imaging, suggests that Low Inner-Acceptant subjects typically switch attention from internal to external sources of stimulation and that when they do focus attention narrowly (as in vivid imagery), their capacity for discrimination improves further. High Inner-Acceptant subjects, on the other hand, typically focus attention so directly and intensely on imagery that sensory input is blocked from awareness.

Implications

In summary, the findings reported in this study provide further evidence for the assumption that imagery and perception are intimately related. These data confirmed that the blocking effect of imagery on perception occurs within the subject, and they can most parsimoniously be explained as due to the influence of selective attention.

One important line of investigation is the pursuit of physiological accompaniments of imagery. Such studies will be especially valuable in suggesting possible mechanisms underlying the reciprocity of imaging with perception, suggested in the present study as well as in previous articles. For example, if imagery interferes with neural processing of a signal, this may occur at the local receptor level, and the receptor may be biased at the first synapse in such a way that less input is transmitted. Or it is possible that the same input is available, but the image may assimilate some of the stimulus input to "flesh out" the imagery, and thus the subject must make a detection decision with reduced stimulus input. Or

it is also possible that imaging and perception affect the local receptors differently, but that they both utilize the same higher sensory pathways, and there is competition for channel space at these levels.

Physiological correlates of the responses obtained in the signal detection experiments should help to solve this theoretical question. It should be possible to determine to what extent the Perky effect may depend on simple receptor adjustments like eye movement and pupillary diameter changes; and it should also be possible to find more central indicators, EEG changes and evoked potentials, which correlate with some of the psychological measures and this may help to clarify some of the effects of imagery on perception.

APPENDIX A

PRE-ACCEPTANCE QUESTIONNAIRE

Code No. _____

Name _____

Sex _____

Age _____

Year _____

Phone No. _____

We are asking your cooperation in responding to a three-part questionnaire about your inner experiences, your images, dreams and daydreams. Your cooperation is necessary if psychologists are to be able to gather information on the personal experiences we may all have which can later serve as bases for understanding the range of human thought. You can be assured that your anonymity will be preserved. Future use of this data will only make use of code numbers and the list of names will be destroyed at the end of the initial research period. It is possible that some of you may be requested to participate in future research in connection with this project. Those of you who are called will be paid for your participation and appointments will be made at your convenience.

Thank you in advance

OPINION SURVEY

This survey consists of numbered statements. Read each statement and decide whether it is true as applied to you or false as applied to you. If a statement is TRUE or MOSTLY TRUE, as applied to you, place a T in the space corresponding to the number of the statement. If a statement is FALSE or NOT USUALLY TRUE, as applied to you, place an F in the proper space. Remember to give YOUR OWN opinion of yourself. Do not leave any blank spaces.

_____ 1. I wake up fresh and rested most mornings.

_____ 2. My hands and feet are usually warm enough.

_____ 3. My daily life is full of things that keep me interested.

_____ 4. There seems to be a lump in my throat much of the time.

_____ 5. Once in a while I think of things too bad to talk about.

_____ 6. At times I have fits of laughing and crying that I cannot control.

_____ 7. I feel that it is certainly best to keep my mouth shut when I am in trouble.

_____ 8. I find it hard to keep my mind on a task or job.

_____ 9. I seldom worry about my health.

_____ 10. I have had periods of days, weeks, or months when I couldn't take care of things because I couldn't get going.

_____ 11. My sleep is fitful and disturbed.

_____ 12. Much of the time my head seems to hurt all over.

_____ 13. I am in just as good physical health as most of my friends.

_____ 14. I prefer to pass by school friends, or people I know but have not seen for a long time, unless they speak to me first.

_____ 15. I am almost never bothered by pains over the heart or in my chest.

_____ 16. I am a good mixer.

_____ 17. I wish I could be as happy as others seem to be.

_____ 18. Most of the time I feel blue.

_____ 19. I am certainly lacking in self-confidence.

_____ 20. I usually feel that life is worthwhile.

_____ 21. It takes a lot of arguement to convince most people of the truth.

_____ 22. I think most people would lie to get ahead.

_____ 23. I do many things which I regret afterwards (I regret things more or more often than others seem to).

_____ 24. I have very few quarrels with members of my family.

_____ 25. My hardest battles are with myself.

_____ 26. I have little or no trouble with my muscles twitching or jumping.

_____ 27. I don't seem to care what happens to me.

_____ 28. Much of the time I feel as if I have done something wrong or evil.

_____ 29. I am happy most of the time.

_____ 30. Some people are so bossy that I feel like doing the opposite of what they request, even though I know they are right.

_____ 31. Often I feel as if there were a tight band about my head.

_____ 32. I seem to be about as capable and smart as most others around me.

_____ 33. Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it.

_____ 34. Often I can't understand why I have been so cross and grouchy.

_____ 35. I do not worry about catching diseases.

_____ 36. I commonly wonder what hidden reason another person may have for doing something nice for me.

_____ 37. Criticism or scolding hurts me terribly.

_____ 38. My conduct is largely controlled by the customs of those about me.

_____ 39. I certainly feel useless at times.

_____ 40. At times I feel like picking a fist fight with someone.

_____ 41. I have often lost out on things because I couldn't make up my mind soon enough.

_____ 42. It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important.

_____ 43. Most nights I go to sleep without thoughts or ideas bothering me.

_____ 44. I cry easily.

_____ 45. I cannot understand what I read as well as I used to.

_____ 46. I have never felt better in my life than I do now.

_____ 47. I resent having anyone take me in so cleverly that I have had to admit that it was one on me.

_____ 48. I do not tire quickly.

_____ 49. I like to study and read about things that I am working at.

_____ 50. I like to know some important people because it makes me feel important.

_____ 51. It makes me feel uncomfortable to put on a stunt at a party even when others are doing the same sort of things.

_____ 52. I frequently have to fight against showing that I am bashful.

_____ 53. I seldom or never have dizzy spells.

_____ 54. My memory seems to be all right.

_____ 55. I am worried about sex matters.

_____ 56. I find it hard to make talk when I meet new people.

_____ 57. I am afraid of losing my mind.

_____ 58. I frequently notice my hand shakes when I try to do something.

_____ 59. I can read a long while without tiring my eyes.

_____ 60. I feel weak all over much of the time.

_____ 61. I have very few headaches.

_____ 62. Sometimes, when embarassed, I break out in a sweat which annoys me greatly.

_____ 63. I have had no difficulty in keeping my balance in walking.

_____ 64. I wish I were not so shy.

_____ 65. I enjoy many different kinds of play and recreation.

_____ 66. In walking I am very careful to step over sidewalk cracks.

_____ 67. I frequently find myself worrying about something.

_____ 68. I hardly ever notice my heart pounding and I am seldom short of breath.

_____ 69. I get mad easily and then get over it soon.

_____ 70. I brood a great deal.

_____ 71. I have periods of such great restlessness that I cannot sit long in a chair.

_____ 72. I dream frequently about things that are best kept to myself.

_____ 73. I believe I am no more nervous than most others.

_____ 74. I have few or no pains.

_____ 75. I have difficulty in starting to do things.

_____ 76. It is safer to trust nobody.

_____ 77. Once a week or oftener I become very excited.

_____ 78. When in a group of people I have trouble thinking of the right things to talk about.

_____ 79. When I leave home I do not worry about whether the door is locked and the windows closed.

_____ 80. I have often felt that strangers were looking at me critically.

_____ 81. I drink an unusually large amount of water everyday.

_____ 82. I am always disgusted with the law when a criminal is freed through the arguements of a smart lawyer.

_____ 83. I work under a great deal of tension.

_____ 84. I am likely not to speak to people until they speak to me.

_____ 85. Life is a strain for me much of the time.

_____ 86. In school I found it very hard to talk before the class.

_____ 87. Even when I am with people I feel lonely much of the time.

_____ 88. I think nearly anyone would tell a lie to keep out of trouble.

_____ 89. I am easily embarassed.

_____ 90. I worry over money and business.

_____ 91. I feel anxiety about something or someone almost all the time.

_____ 92. I easily become impatient with people.

_____ 93. Sometimes I become so excited that I find it hard to get to sleep.

_____ 94. I forget right away what people say to me.

_____ 95. I usually have to stop and think before I act even in trifling matters.

_____ 96. Often I cross the street in order not to meet someone I know.

_____ 97. I often feel as if things were not real.

_____ 98. I have a habit of counting things that are not important such as bulbs on electric signs, and so forth.

_____ 99. I have strange and peculiar thoughts.

_____100. I have been afraid of things or people that I knew could not hurt me.

_____101. I have no dread of going into a room by myself where other people have already gathered and are talking.

_____102. I have more trouble concentrating than others seem to have.

_____103. I have several times given up doing a thing because I thought too little of my ability.

_____104. Bad words, often terrible words, come into my mind and I cannot get rid of them.

_____105. Sometimes some unimportant thought will run through my mind and bother me for days.

_____106. Almost every day something happens to frighten me.

_____107. I am inclined to take things hard.

_____108. I am more sensitive than most other people.

_____109. At periods my mind seems to work more slowly than usual.

_____110. I very seldom have spells of the blues.

_____111. I wish I could get over worrying about things I have said that may have injured other people's feelings.

_____112. People often disappoint me.

_____113. I feel unable to tell anyone all about myself.

_____114. My plans have frequently seemed so full of difficulties that I have had to give them up.

_____115. Often, even though everything is going fine for me, I feel that I don't care about anything.

_____116. I have sometimes felt that difficulties were piling up so high that I could not overcome them.

_____117. I often think, "I wish I were a child again".

_____118. It makes me feel like a failure when I hear of the success of someone I know well.

_____119. I am apt to take disappointments so keenly that I can't put them out of my mind.

_____120. At times I think I am no good at all.

_____121. I worry quite a bit over possible misfortunes.

_____122. I am apt to pass up something I want to do because others feel that I am not going about it in the right way.

_____123. I have several times had a change of heart about my life work.

_____124. I have a daydream life about which I do not tell other people.

_____125. I have often felt guilty because I have pretended to feel more sorry about something than I really was.

_____126. I feel tired a good deal of the time.

_____127. I sometimes feel that I am about to go to pieces.

DAYDREAMING QUESTIONNAIRE

PART A

There are 12 questions in Part A. Each question has 5 possible answers corresponding to the numbers 1 through 5. For each question, circle the answer which is most true or appropriate for you. Please note that when we use words like "daydreams" we are using popular terminology for which there is no official definition. You may have a particular idea of what you mean by a daydream or fantasy. Try to answer these items as they seem most to apply to you. Make a distinction between thinking about an immediate task you're performing, e.g. working, doing schoolwork and daydreaming which involves thoughts unrelated to a task you are working on or else thoughts that go on while you are getting ready for sleep or on a long bus or train ride.

1. I daydream
   1. infrequently.
   2. once a week .
   3. once a day.
   4. a few times during the day.
   5. many different times during the day.

2. Daydreams or fantasies make up
   1. no part of my waking thoughts.
   2. less than 10% of my waking thoughts.
   3. at least 10% of my waking thoughts.
   4. " " 25% " " " " .
   5. " " 50% " " " " .

3. As regards daydreaming, I would characterize myself as
   1. someone who never daydreams.
   2. someone who very rarely engages in daydreaming.
   3. someone who tends toward occasional daydreaming.
   4. someone who tends toward moderate daydreaming.
   5. an habitual daydreamer.

4. I recall or think over my daydreams
   1. infrequently.
   2. once a week.
   3. once a day.
   4. a few times during the day.
   5. many different times during the day.

5. When I am not paying close attention to some job, book, or TV, I tend to be daydreaming
   1. 0% of the time.
   2. 10% of the time.
   3. 25% of the time.
   4. 50% of the time.
   5. 75% of the time.

6. Instead of noticing people and events in the world around me, I will spend approximately
   1. 0% of my time lost in thought.
   2. less than 10% of my time lost in thought.
   3. 10% of my time lost in thought.
   4. 25% of my time lost in thought.
   5. 50% of my time lost in thought.

7. I daydream at work (or school)
   1. infrequently.
   2. once a week.
   3. once a day.
   4. a few times during the day.
   5. many different times during the day.

8. Recalling things from the past, thinking of the future, or imagining unusual kinds of events occupies
   1. 0% of my waking day.
   2. less than 10% of my waking day.
   3. 10% of my waking day.
   4. 25% of my waking day.
   5. 50% of my waking day.

9. I lose myself in active daydreaming
   1. infrequently.
   2. once a week.
   3. once a day.
   4. a few times during the day.
   5. many different times during the day.

10. Whenever I have time on my hands I daydream
    1. never.
    2. rarely.
    3. sometimes.
    4. frequently.
    5. always.

11. When I am at a meeting or show that is not very interesting, I daydream rather than pay attention
    1. never.
    2. rarely.
    3. sometimes.
    4. frequently.
    5. always.

12. On a long bus or train ride I daydream
    1. never.
    2. rarely.
    3. occasionally.
    4. frequently.
    5. a great deal of the time.

PART B

All of the items in Part B are statements about daydreams or daydreaming. Indicate to what extent each item applies to you or is true for you by circling the appropriate answer. Allow yourself some time for each item in order to examine your thoughts but do not spend too long trying to get the exact answer. The scale is again one which goes from 1 to 5. Thus, 5 stands for "Definitely true" and 1 for "Definitely false". 2, 3, and 4 are the intermediate steps. Circle that number which you feel is the most appropriate for that particular statement. Check the scale to make certain your response is what you mean it to be. Do this for each item.

Scale:

Definitely true - 5; Usually true - 4; Sometimes true, sometimes false - 3;
Usually false - 2; Definitely false - 1

13. The voices of people who are important to me sound very clear when I daydream about them. 5 4 3 2 1

14. My fantasies often consist of black-and-white or color images. 5 4 3 2 1

15. As a child, I was a constant daydreamer. 5 4 3 2 1

16. Daydreams accomplish nothing more than a temporary escape and just avoid things that must be done. 5 4 3 2 1

17. If something is really on my mind I often brood on it for hours on end. 5 4 3 2 1

18. I can see the people or things in my daydreams as if they were moving around. 5 4 3 2 1

19.	My imagination often goes around and around in the smae circle.	5 4 3 2 1
20.	When a child, I would often create a great fantasy world for myself.	5 4 3 2 1
21.	I can often "see" a large number of things or people in my fantasies.	5 4 3 2 1
22.	I feel guilty about my daydreams.	5 4 3 2 1
23.	During a daydream, I sometimes feel a very strong sense of excitement.	5 4 3 2 1
24.	I do not really "see" the objects in a daydream.	5 4 3 2 1
25.	Daydreams are unreal and seldom come true.	5 4 3 2 1
26.	I become so affected by my daydreams that they will subsequently determine my mood.	5 4 3 2 1
27.	I seldom have the same daydream more than once.	5 4 3 2 1
28.	Sometimes a daydream will make me so upset that I feel like crying.	5 4 3 2 1
29.	My daydreams often cheer me up when I feel blue.	5 4 3 2 1
30.	The "pictures in my mind" seem as clear as photographs.	5 4 3 2 1
31.	I often daydream about events that happened over a year ago.	5 4 3 2 1
32.	My fantasies usually provide me with pleasant thoughts.	5 4 3 2 1
33.	My daydreams often leave me with a warm, happy feeling.	5 4 3 2 1
34.	When I have an unusually enjoyable daydream, I try to prevent it from coming to an end.	5 4 3 2 1
35.	Daydreaming never solves any problems.	5 4 3 2 1
36.	Daydreaming in an adult is really childish.	5 4 3 2 1
37.	I sometimes have a very clear, lifelike picture of what I am imagining.	5 4 3 2 1
38.	Sometimes a thrill goes up my spine as I reflect on a great amount of triumph and achievement.	5 4 3 2 1

39. Daydreams are more likely to arouse pleasant than unpleasant emotion within me. 5 4 3 2 1

40. I find my daydreams are worthwhile and interesting to me. 5 4 3 2 1

41. Something that has happened during the day often goes over and over in my mind. 5 4 3 2 1

42. I usually feel content and quite excited after a daydream. 5 4 3 2 1

43. During a daydream, voices seem to come in loudly and clearly and then fade. 5 4 3 2 1

44. I can hear conversations between myself and other people very clearly in my mind during a daydream. 5 4 3 2 1

45. My daydreams are usually accompanied by the sounds of the subjects of my daydreams. 5 4 3 2 1

46. The scenes of my daydreams are never longer than brief flashes. 5 4 3 2 1

47. Because daydreaming often takes me away from my work, I try to avoid it even when I have no specific task to complete. 5 4 3 2 1

48. The "scenes" in my daydreams are sort of fuzzy and unclear. 5 4 3 2 1

49. A daydream can bring a smile to my face. 5 4 3 2 1

50. In a daydream, I can hear a tune almost as clearly as if I were actually listening to it. 5 4 3 2 1

51. Sometimes sounds I've heard in the past come into my mind during a daydream as if I could almost hear them again. 5 4 3 2 1

52. Sometimes my imagination keeps coming back to the same things over and over again, no matter how much I try to change the subject. 5 4 3 2 1

53. When people speak in my daydreams, I cannot really hear their voices. 5 4 3 2 1

54. A really original idea can sometimes develop from a really fantastic daydream. 5 4 3 2 1

55. I can still remember scenes from recent daydreams. 5 4 3 2 1

56.	Daydreaming is normal for adults as well as for adolescents and children.	5 4 3 2 1
57.	Visual scenes are an important part of my daydreams.	5 4 3 2 1
58.	I often have the same daydream over and over again.	5 4 3 2 1
59.	Daydreaming is a common experience for great scientists and artists as well as for the average person.	5 4 3 2 1
60.	I feel very emotional during my daydreams.	5 4 3 2 1
61.	I feel badly about daydreaming because it may indicate a weakness in character.	5 4 3 2 1
62.	My daydreams are often stimulating and rewarding.	5 4 3 2 1
63.	I can be aroused and excited by a daydream.	5 4 3 2 1
64.	I often have some kind of emotional reaction to my daydreams which lasts for a long time afterward.	5 4 3 2 1
65.	A piece of music sometimes runs through my head as clearly as if I were listening to it on a transistor radio.	5 4 3 2 1
66.	Some of my daydreams are so powerful that I just can't take my attention away from them.	5 4 3 2 1
67.	My daydreams are mostly made up of thoughts and feelings rather than visual images.	5 4 3 2 1
68.	My daydreams often leave me with feelings of sadness.	5 4 3 2 1
69.	Some of my daydreams are so striking that I keep on thinking about them after they are over.	5 4 3 2 1
70.	When I do hear voices in my thoughts, they are not really very clear or recognizable.	5 4 3 2 1
71.	A daydream can completely change my mood.	5 4 3 2 1
72.	The fewer daydreams one has, the more time there is to really "live".	5 4 3 2 1
73.	I sometimes seem to be able to hear the characters in my fantasies talking to one another.	5 4 3 2 1
74.	I can hear music with shades of both softness and loudness in my daydreams.	5 4 3 2 1

75. I often relive happy or exciting experiences in my daydreams. 5 4 3 2 1

76. A "happy" daydream helps me to "snap out of" a spell of unhappiness. 5 4 3 2 1

77. I tend to get pretty wrapped up in my daydreaming. 5 4 3 2 1

78. The sounds I hear in my daydreams are clear and distinct. 5 4 3 2 1

79. My daydreams seldom repeat themselves. 5 4 3 2 1

80. The "scenes" in my daydreams are so vivid and clear to me that my eyes seem actually to follow them. 5 4 3 2 1

THE BETTS QMI VIVIDNESS OF IMAGERY SCALE

The aim of this test is to determine the vividness of your imagery. Images are mental pictures, usually of things you have seen, sometimes of things you would like to see. The items of the test will bring certain images to your mind. You are to rate the vividness of each image by reference to the accompanying rating scale, which is shown at the bottom of the page. For example, if your image is "vague and dim" you giving it a rating of 5. Record your answers on the answer sheet you have. Just write the appropriate number after each item. Before you turn to the items on the next page, familiarize yourself with the different categories on the rating scale. Throughout the test, refer to the rating scale when judging the vividness of each image. Complete each page before moving on to the next page. Try to do each item separately independent of how you may have done other items.

The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience	Rating 1
Very clear and comparable in vividness to the actual experience	Rating 2
Moderately clear and vivid	Rating 3
Not clear or vivid, but recognizable	Rating 4
Vague and dim	Rating 5
So vague and dim as to be hardly discernible	Rating 6
No image present at all, you only "knowing" that you are thinking of the object	Rating 7

Now turn to the next page when you have understood these instructions and begin the test.

Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. Classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the rating scale.

1. The exact contour of face, head, shoulders and body.
2. Characteristic poses of head, attitudes of body, etc.
3. The precise carriage, length of step, etc. in walking.
4. The different colors worn in some familiar costume.

Think of seeing each of the following, considering carefully the picture which comes before your mind's eye; and classify the image suggested by the following question as indicated by the degrees of clearness and vividness specified on the rating scale.

5. The sun as it is sinking below the horizon.

Think of each of the following sounds, considering carefully the image which comes to your mind's ear, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the rating scale.

6. The whistle of a locomotive.
7. The honk of an automobile.
8. The mewing of a cat.
9. The sound of escaping steam.
10. The clapping of hands in applause.

Think of performing each of the following acts, considering carefully the image which comes to your mind's arms, legs, and lips, etc., and classify the images suggested as indicated by the degrees of clearness and vividness specified on the rating scale.

11. Running upstairs.
12. Springing across a gutter.
13. Drawing a circle on paper.
14. Reaching up to a high shelf.
15. Kicking something out of your way.

Think of "feeling" or touching each of the following, considering carefully the image which comes to your mind's touch, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the rating scale.

16. Sand.
17. Linen.
18. Fur.
19. The prick of a pin.
20. The warmth of a tepid bath.

Think of tasting each of the following considering carefully the image which comes to your mind's mouth, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the rating scale.

21. Salt.
22. Granulated (white) sugar.
23. Oranges.
24. Jelley.
25. Your favorite soup.

Think of smelling each of the following, considering carefully the image which comes to your mind's nose and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the rating scale.

26. An ill-ventilated room.
27. Cooking cabbage.
28. Roast beef.
29. Fresh paint.
30. New leather.

Think of each of the following sensations, considering carefully the image which comes before your mind, and classify the images suggested as indicated by the degrees of clearness and vividness specified on the rating scale.

31. Fatigue.
32. Hunger.
33. A sore throat.
34. Drowsiness.
35. Repletion as from a full meal.

APPENDIX V

LIST OF IMAGES

Name _____

1.	C	handkerchief	S_____	26.	D		N_____
2.	R	coffee pot	N_____	27.	C	statue	N_____
3.	R	bride	S_____	28.	R	school bag	S_____
4.	D		N_____	29.	D		N_____
5.	D		S_____	30.	D		S_____
6.	D		S_____	31.	D		N_____
7.	D		N_____	32.	C	broom	S_____
8.	C	ladder	N_____	33.	D		N_____
9.	D		N_____	34.	D		S_____
10.	C	tie	N_____	35.	R	map	N_____
11.	D		N_____	36.	D		S_____
12.	D		S_____	37.	C	bureau	N_____
13.	R	garden	N_____	38.	R	bath tub	S_____
14.	D		S_____	39.	R	toothbrush	N_____
15.	C	wallet	S_____	40.	D		S_____
16.	C	costume	S_____	41.	D		N_____
17.	D		S_____	42.	D		N_____
18.	D		N_____	43.	D		S_____
19.	R	eyeglasses	S_____	44.	C	comb	N_____
20.	C	mirror	N_____	45.	C	phonograph	S_____
21.	D		S_____	46.	D		S_____
22.	R	table	N_____	47.	R	television	N_____
23.	R	chandelier	S_____	48.	D		N_____
24.	D		N_____	49.	R	belt	S_____
25.	R	photograph	N_____	50.	D		S_____

51.	D		N_____	76.	D		S_____
52.	D		S_____	77.	R	friend	S_____
53.	R	bus	S_____	78.	C	bathing suit	S_____
54.	C	airplane	N_____	79.	R	gloves	N_____
55.	D		S_____	80.	R	desk	N_____
56.	C	radio	S_____	81.	D		S_____
57.	C	classroom	N_____	82.	C	birthday cake	N_____
58.	R	playground	N_____	83.	R	ball	N_____
59.	D		N_____	84.	D		S_____
60.	C	notebook	S_____	85.	C	wastebasket	S_____
61.	D		S_____	86.	R	policeman	S_____
62.	D		N_____	87.	D		N_____
63.	D		N_____	88.	D		N_____
64.	D		N_____	89.	C	highway	N_____
65.	C	man	S_____	90.	D		N_____
66.	D		S_____	91.	D		S_____
67.	C	baby	N_____	92.	D		S_____
68.	D		S_____	93.	D		N_____
69.	D		S_____	94.	C	stage	S_____
70.	R	parade	S_____	95.	D		N_____
71.	D		N_____	96.	D		N_____
72.	D		N_____	97.	R	shoes	N_____
73.	C	sweat er	N_____	98.	D		N_____
74.	D		S_____	99.	C	refrigerator	S_____
75.	R	woman	S_____	100.	C	cookies	N_____

101.	R	telephone	N_____	126.	C	school	S_____
102.	D		S_____	127.	C	Doctor	S_____
103.	R	typewriter	N_____	128.	D		N_____
104.	C	cafeteria	S_____	129.	R	bicycle	S_____
105.	C	doll	S_____	130.	C	pack of cigarettes	N_____
106.	D		S_____	131.	D		S_____
107.	R	radio	S_____	132.	D		S_____
108.	C	ash tray	N_____	133.	C	vocalist	S_____
109.	D		S_____	134.	R	ice skates	N_____
110.	C	park	N_____	135.	D		N_____
111.	R	library	N_____	136.	C	painting	N_____
112.	C	coat	S_____	137.	D		S_____
113.	R	scarf	S_____	138.	D		S_____
114.	D		S_____	139.	R	teacher	S_____
115.	R	staircase	N_____	140.	D		N_____
116.	R	street	S_____	141.	D		S_____
117.	C	dog	N_____	142.	D		N_____
118.	D		N_____	143.	D		N_____
119.	C	bird	S_____	144.	R	sweetheart	N_____
120.	D		N_____	145.	C	cowboy	S_____
121.	R	house	S_____	146.	D		S_____
122.	C	water fountain	N_____	147.	R	snow	N_____
123.	D		S_____	148.	R	stuffed animal	S_____
124.	C	bed	S_____	149.	D		S_____
125.	R	sofa	S_____	150.	D		S_____

151.	D		N_____	176.	D		S_____
152.	C	blanket	N_____	177.	D		S_____
153.	D		N_____	178.	R	slippers	S_____
154.	R	cup and saucer	N_____	179.	D		N_____
155.	V	sneakers	S_____	180.	C	clock	N_____
156.	D		N_____	181.	D		N_____
157.	D		S_____	182.	D		N_____
158.	D		N_____	183.	R	car	N_____
159.	D		S_____	184.	D		S_____
160.	R	clown	N_____	185.	D		N_____
161.	C	door	N_____	186.	C	tree	S_____
162.	D		N_____	187.	R	chair	N_____
163.	D		S_____	188.	C	hair	S_____
164.	R	boat	N_____	189.	D		S_____
165.	D		N_____	190.	D		S_____
166.	D		S_____	191.	D		N_____
167.	D		N_____	192.	D		S_____
168.	C	watch	N_____	193.	C	umbrella	N_____
169.	R	plant	S_____	194.	R	dress	S_____
170.	D		N_____	195.	R	lamp	S_____
171.	R	book	S_____	196.	C	vase	S_____
172.	D		N_____	197.	D		N_____
173.	D		S_____	198.	R	hat	S_____
174.	C	ring	N_____	199.	D		N_____
175.	D		S_____	200.	R	camera	N_____

201.	C	coffee pot	S_____	226.	D		S_____
202.	D		S_____	227.	R	bureau	S_____
203.	D		N_____	228.	D		S_____
204.	C	bride	N_____	229.	D		N_____
205.	C	garden	N_____	230.	C	photograph	N_____
206.	D		S_____	231.	C	school bag	S_____
207.	R	handkerchief	S_____	232.	R	comb	N_____
208.	C	eyeglasses	S_____	233.	C	map	S_____
209.	D		N_____	234.	D		N_____
210.	D		S_____	235.	C	bath tub	N_____
211.	D		N_____	236.	D		N_____
212.	R	ladder	S_____	237.	R	phonograph	S_____
213.	D		N_____	238.	C	toothbrush	S_____
214.	D		N_____	239.	D		S_____
215.	D		N_____	240.	D		N_____
216.	C	table	S_____	241.	R	airplane	N_____
217.	D		N_____	242.	C	television	N_____
218.	R	wallet	S_____	243.	R	radio	N_____
219.	R	costume	S_____	244.	C	belt	S_____
220.	D		S_____	245.	R	classroom	N_____
221.	R	mirror	N_____	246.	C	bus	S_____
222.	C	chandelier	N_____	247.	D		N_____
223.	D		S_____	248.	D		N_____
224.	R	statue	S_____	249.	R	notebook	S_____
225.	R	broom	N_____	250.	D		S_____

251.	D		N_____	276.	C	ball	S_____
252.	D		S_____	277.	D		N_____
253.	D		N_____	278.	C	policeman	N_____
254.	C	playground	N_____	279.	D		S_____
255.	D		S_____	280.	D		N_____
256.	D		N_____	281.	R	highway	N_____
257.	R	man	N_____	282.	C	shoes	N_____
258.	R	baby	S_____	283.	R	stage	S_____
259.	D		N_____	284.	D		S_____
260.	D		S_____	285.	D		S_____
261.	C	parade	S_____	286.	D		S_____
262.	R	sweat er	S_____	287.	C	telephone	N_____
263.	C	woman	N_____	288.	C	typewriter	S_____
264.	D		N_____	289.	R	refrigerator	S_____
265.	D		N_____	290.	D		S_____
266.	C	friend	N_____	291.	R	cookies	N_____
267.	R	bathing suit	S_____	292.	D		S_____
268.	D		N_____	293.	D		N_____
269.	D		S_____	294.	R	cafeteria	N_____
270.	D		N_____	295.	C	radio	N_____
271.	C	gloves	S_____	296.	D		S_____
272.	D		N_____	297.	D		N_____
273.	R	birthday cake	N_____	298.	R	doll	S_____
274.	R	wastebasket	S_____	299.	D		N_____
275.	C	desk	S_____	300.	D		S_____

251.	D		N_____	276.	C	ball	S_____
252.	D		S_____	277.	D		N_____
253.	D		N_____	278.	C	policeman	N_____
254.	C	playground	N_____	279.	D		S_____
255.	D		S_____	280.	D		N_____
256.	D		N_____	281.	R	highway	N_____
257.	R	man	N_____	282.	C	shoes	N_____
258.	R	baby	S_____	283.	R	stage	S_____
259.	D		N_____	284.	D		S_____
260.	D		S_____	285.	D		S_____
261.	C	parade	S_____	286.	D		S_____
262.	R	sweat er	S_____	287.	C	telephone	N_____
263.	C	woman	N_____	288.	C	typewriter	S_____
264.	D		N_____	289.	R	refrigerator	S_____
265.	D		N_____	290.	D		S_____
266.	C	friend	N_____	291.	R	cookies	N_____
267.	R	bathing suit	S_____	292.	D		S_____
268.	D		N_____	293.	D		N_____
269.	D		S_____	294.	R	cafeteria	N_____
270.	D		N_____	295.	C	radio	N_____
271.	C	gloves	S_____	296.	D		S_____
272.	D		N_____	297.	D		N_____
273.	R	birthday cake	N_____	298.	R	doll	S_____
274.	R	wastebasket	S_____	299.	D		N_____
275.	C	desk	S_____	300.	D		S_____

301.	D		S_____	326.	C	house	N_____
302.	D		N_____	327.	D		N_____
303.	C	library	N_____	328.	D		S_____
304.	D		S_____	329.	D		S_____
305.	D		N_____	330.	D		N_____
306.	D		S_____	331.	D		S_____
307.	R	ash tray	N_____	332.	D		N_____
308.	C	scarf	N_____	333.	D		S_____
309.	R	park	S_____	334.	C	sofa	S_____
310.	D		S_____	335.	D		N_____
311.	D		S_____	336.	R	bed	N_____
312.	C	staircase	S_____	337.	D		S_____
313.	R	coat	S_____	338.	R	school	S_____
314.	D		S_____	339.	R	Doctor	N_____
315.	D		S_____	340.	R	pack of cigarettes	N_____
316.	D		N_____	341.	C	bicycle	N_____
317.	D		S_____	342.	R	vocalist	N_____
318.	R	dog	N_____	343.	R	painting	S_____
319.	D		N_____	344.	C	ice skates	S_____
320.	D		S_____	345.	D		N_____
321.	D		N_____	346.	D		S_____
322.	C	street	N_____	347.	D		N_____
323.	R	bird	S_____	348.	D		S_____
324.	R	water fountain	S_____	349.	R	cowboy	N_____
325.	D		N_____	350.	C	teacher	S_____

351.	D		N_____	376.	D		S_____
352.	D		S_____	377.	D		N_____
353.	C	sweetheart	N_____	378.	D		S_____
354.	R	blanket	N_____	379.	D		N_____
355.	C	snow	N_____	380.	R	clock	N_____
356.	R	sneakers	S_____	381.	C	car	N_____
357.	D		S_____	382.	R	tree	S_____
358.	D		S_____	383.	D		N_____
359.	D		S_____	384.	R	hair	N_____
360.	D		N_____	385.	C	chair	S_____
361.	C	stuffed animal	N_____	386.	R	umbrella	N_____
362.	C	cup and saucer	S_____	387.	C	dress	S_____
363.	R	door	N_____	388.	C	lamp	S_____
364.	C	clown	S_____	389.	C	hat	N_____
365.	C	boat	S_____	390.	D		S_____
366.	R	watch	N_____	391.	D		N_____
367.	C	plant	N_____	392.	R	vase	N_____
368.	C	book	S_____	393.	D		S_____
369.	D		N_____	394.	D		N_____
370.	C	slippers	N_____	395.	R	tie	S_____
371.	D		S_____	396.	D		N_____
372.	D		N_____	397.	D		S_____
373.	D		S_____	398.	D		S_____
374.	D		N_____	399.	C	camera	S_____
375.	R	ring	S_____	400.	D		S_____

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