THE ROLE OF SELECTIVE INHIBITORY CONTROL OF ATTENTION IN RAT (REMOTE ASSOCIATES TEST) PERFORMANCE

by

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Abstract

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by

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This dissertation investigated how performance on Mednick's Remote Associates Test (RAT), a widely used measure of creative ability, relates to the capacity to selectively direct attention to a task at hand while resisting interference from distracting and compelling cues. Previous research suggests that good RAT performance (and purportedly creativity) relates to the ability to gain access to many associations and tentatively suggests that high RAT performers are characterized by greater distractability and less control over attention deployment. The present writer however, hypothesized that RAT performance was positively related to the capacity to "tune out" and resist distraction from compelling task irrelevant cues. A theoretical rationale for this prediction was presented.

Eighty-five sophomore undergraduate students (41 males and 44 females) participated in the present study. In addition to the RAT, two selective attention tasks were administered each of which required the ability to inhibit responding to compelling stimuli.

The Associative Distraction Test (ADT) was designed by the author to measure an individual's ability to resist distraction from salient word associations and compelling contextual cues. A non-verbal selective attention task, the Speed of Color Discrimination Test (SCDT) was also included, as well as an abbreviated form of the WAIS vocabulary test to estimate and control for verbal ability.

The central hypothesis that RAT performance would be positively related to good selective-inhibitory control of attention as measured by ADT performance, was tested by a univariate analysis of variance. When vocabulary skill was controlled, there was a significant positive relationship between ADT and RAT scores for males only. It was suggested that for males, effective RAT performance and the related ability to gain access to remote associations is related to the ability to tune out dominant and compelling associations and contextual cues.

The prediction that RAT performance would be related to SCDT scores was examined by computing the product-moment correlation between these measures. No significant results were obtained, suggesting that RAT performance is independent of the skills tapped by this non-verbal selective attention task.

The relationship between the two selective attention tasks (the ADT and SCDT) was investigated with a univariate analysis of variance. The data failed to support the third hypothesis that performance on these two tasks would be positively related. The finding that the capacity to resist distraction from verbal cues

(as measured by ADT performance) was unrelated to the capacity to resist distraction from perceptual cues (as measured by SCDT performance) was discussed in terms of its significance for research regarding cognitive styles and attention deployment.

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Introduction

Although "creative genius" has been recognized and highly valued throughout man's history, there was relatively little scientific investigation of this subject during the six or seven decades before 1950 (Guilford, 1968). Since this time, however, there has been a lively upsurge of interest on the part of philosophers, psychologists, and scientists in numerous and varied fields of study. The creative process has been studied phenomenologically through the journals and introspective reports of creative individuals (Ghiselin, 1952) and has received considerable attention both from psychoanalytically oriented investigators (Kris, 1953; Kubie, 1958) and experimental psychologists (Guilford, 1968; Barron, 1963).

Despite growing enthusiasm, research in creativity remains beset by special problems and difficulties (Ginsburg and Whittemore, 1968). For one thing, there is very little consistency in criterion ratings of creativity which relates to a major difficulty in this area of research -- the absence of an ultimate criterion for creative performance.(Dellas and Gaier, 1970). Another major problem involves the difficulty in distinguishing between creative and intellectual ability, and although this problem has frequently been raised (Barron, 1963; Getzels and Jackson, 1962) no adequate resolution has yet been found (Ginsburg and Whittemore, 1968). In fact, it is all too common for researchers to ignore this problem entirely and to assume that creativity is an entity which is independent of intellectual aptitudes. Another source of difficulty stems from the tendency of researchers to conceptualize "creativity" in a global and

undifferentiated manner. Although it is clear that a very great variety of skills are subsumed under the rubric "creativity", Mendelsohn (1966) has pointed out that researchers have often considered "creative individuals" to be a homogeneous group who are characterized by a unitary creative process. Compounding the problem is the rapid proliferation of creativity tests many of which are poorly validated and have low or unknown reliabilities (Ginsburg and Whittemore, 1968).

Measuring Creativity

If "creativity" consists of a collection of different traits and abilities which are not independent of the medium in which they become manifest, it is not surprising that instruments which purportedly measure "creative ability" have been of equivocal success. Mednick (1962), Torrance (1962) and Wallach and Kogan (1965) are among the many researchers who have been involved in the development of creativity tests. In evaluating the success of such instruments, Worthen and Clark (1971) have aptly commented that, "The results of their efforts have left much to be desired" (p. 113).

The problems and limitations regarding current measures of creativity have been discussed in detail by various researchers (Thorndike, 1963; Wallach and Kogan, 1965) who have pointed out that varying measures of "creativity" are hardly equivalent and interchangeable. Mendelsohn (1966), for example, found that his research findings which were based on a verbal test of creativity (Mednick's Remote Associates Test) were not replicated when a non-verbal measure of creative potential was substituted (the Barron-Welsh

Art Scale). Ohnmacht (1970) has demonstrated that studies which identify creative people by employing personality referents, show little correspondence to studies which employ cognitive referents and he suggests caution in comparing studies which identify creative individuals by employing only cognitive or only personality referents. Bower and Clark (1968) demonstrated the relatively low correlations among several creativity measures and Cave's (1970) factor analytic study of creativity and intelligence demonstrated that creativity tests correlate as highly with measures of intellectual functioning as they do with each other. It is clear then, that the various measures of creativity do not have enough in common to merit a single heading, "creativity".

Further, Dellas and Gaier (1970) have noted that tests of creativity have demonstrated a notable lack of success in predictive efficiency and have failed to correlate with demonstrated creative achievement. The fact that assessment instruments do not reliably correlate with criterion ratings is hardly surprising in view of the problems mentioned earlier, that is, the lack of criterion for creativity and the tendency to study "creative individuals" without distinguishing among different types of creative ability each of which may require different cognitive skills. The failure of assessment instruments to correlate with demonstrated creative ability also relates to the fact that creativity tests tend to measure either cognitive abilities or personality factors. Dellas and Gaier (1970) point out that many widely used creativity tests are tests of ability which do not assess the personlogical context

in which the creative process functions. Because personality factors are a major variable in creative performance (despite the fact that little is known regarding their contribution to creative production), the lack of predictive validity of ability tests is not surprising.

Mednick's Remote Associates Test

Although a wide range of personality and intellectual variables have been correlated with creative performance, Mendelsohn (1964) has pointed out that much of this work is not guided by an explicit theory about the process which takes place during the creative thinking. This criticism is an important one and dovetails with Worthen and Clark's (1971) statement that, "progress in measuring creativity is most likely to result from careful theoretical development relating creative behavior to other better-studied psychological processes" (p. 113). Mednick's remote association theory of creativity and his construction of the Remote Associates Test (RAT), which was guided by this theory, exemplifies one such treatment of creativity.

The RAT is derived from a theory of creative ability which has received wide acceptance and it has very frequently been used as the independent measure of creative ability in psychological research. Still, the cognitive referents that underlie successful performance on this test have not been fully clarified. The present study was undertaken in the hope of furthering an understanding of the cognitive skills underlying effective performance on this test, by investigating the relationship between RAT performance and selective-inhibitory control of attention deployment. It is this writer's hypothesis

that good selective-inhibitory control of attention will facilitate RAT performance and that poor selective-inhibitory control of attention will impair RAT performance. In this study, selective-inhibitory control of attention (S.I.C.) refers to the capacity to direct attention to task relevant cues and to "tune out" or inhibit responding to compelling but misleading cues. Put somewhat differently, the author is hypothesizing that RAT performance relates to the capacity to resist responding to distracting and interfering stimuli.

Before elaborating on the author's hypothesis, it is worthwhile to review Mednick's theory of creativity, to describe his creativity test (the RAT) and review its success as a measure of creative potential, and to examine other research work which has attempted to relate RAT performance to individual differences in attention deployment.

Mednick's Theory of Creativity

Mednick's theory is based strictly on an "associative" interpretation of the creative process. According to Mednick, creative thinking involves, "seeing relationships between seemingly 'mutually remote' ideas and forming them into new associative combinations which are either useful or meet some specified criteria". A statement from the mathematician Poincare is clearly in keeping with Mednick's conceptualization of the creative process. (In Mednick and Mednick, 1967)

> To create consists of making new combinations of associative elements which are useful. The mathematical facts worthy of being studied . . . are those which reveal to us unsuspected kinships between other facts well known but wrongly believed to be strangers to one another. Among

> chosen combinations the most fertile will often be those formed of elements drawn from domains which are far apart. (p. 1)

According to Mednick, any ability or tendency which serves to bring otherwise mutually remote ideas into contiguity, will facilitate a creative solution. Two such operations, according to Mednick, involve the number of associative elements available to an individual, (associational breadth) and the shape of an individual's associational hierarchy. In regard to the former, Mednick states that creative individuals have a larger number of associative elements available to them (i.e. they can give a greater number of continuous associations on word association tasks). In regard to the latter, Mednick proposes that creative and noncreative individuals have differing "associative hierarchies" which effects the speed and probability of obtaining a creative solution. Uncreative people purportedly possess a "steep associative hierarchy" in which the associative strength to words and ideas drops off rapidly after a few stereotyped and conventional responses occur. That is, if the word "box" was presented as a stimulus in a free association task the uncreative subject might quickly respond with "key" and "lock" and then have difficulty responding further. The creative individual on the other hand, is said to be characterized by a "flat associative hierarchy" in which initial responses are not overly dominant and there are more associative elements of even associative response strength. In response to the word "box" then, the creative person might say, "key, lock, fists, office, mail . . . ", i.e. he is able to associate longer and thus, with less stereotyped

responses. Mednick (1962) contends that "it is among these more remote responses that the requisite elements and mediating terms for a creative solution will be lurking" (p. 223).

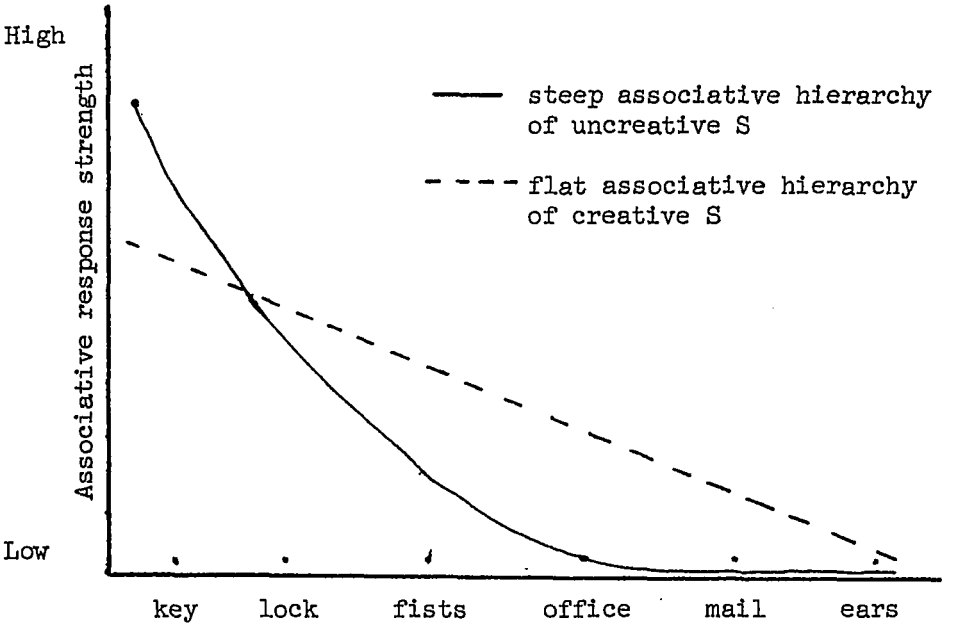

Figure 1

Steep and Flat Associative Hierarchies
Around the Word "Box"

Although Mednick considers associative productivity, and the shape of the associative hierarchy to be two operations underlying creative ability, the latter has not been operationally defined in a manner that allows these two operations to be distinguished one from the other. In fact, the "slope" concept seems to be a hypothetical construct which is inferred from individual differences in associative productivity. That is, if an individual is unable to generate a large number of associations, it is assumed that he has a "steep slope" or a greater concentration of associative

strength in a small number of stereotyped responses. To this writer, the concept of slope, or hierarchical organization of associative elements, does not seem to be operationally distinct from the notion of associative productivity.

The Remote Associates Test

Mednick's operational definition of creativity takes the form of a test, in which the subject must provide mediating links between several words from mutually distant associative clusters. More specifically, the RAT is a controlled association test in which the subject's task is to find an associate which is common to three seemingly unrelated stimulus words (e.g. the word "black" is the solution to the item: magic ball board; the word "sweet" is the solution to the item: cookies sixteen heart). According to Mednick, this test measures "individual differences in an ability considered to be fundamental to the creative thinking process", that is the ability to find an associative connection among seemingly remote stimulus elements.

Validity of the RAT

A substantial amount of research has accumulated regarding the concurrent, predictive, and construct validity of the RAT as an instrument measuring creative ability. A number of studies have demonstrated that the RAT is significantly correlated with independent ratings of creative ability in such diverse groups as architects (Mednick, S. and Halpern, S. 1962), psychology graduate students (Mednick, 1963) and scientists (Gordon, 1966). RAT

performance has also been positively correlated with the degree of creativity manifested in the research products of advanced students in undergraduate psychology (Perrone, 1971). Other studies attesting to the validity of the RAT as a predictor of creative performance are presented by Mednick and Mednick (1967) in their Examiner's Manual.

Besides being related to independent ratings of creative ability, RAT performance has also been related to a variety of cognitive functions, including responsiveness to specific associative priming (Mednick, Mednick, and Mednick, 1964) and the number of available associations on word association tasks (Mednick, Mednick, and Jung, 1964). RAT performance has also been related to personality and motivational factors. It has been shown for example, that high RAT scorers demonstrate a preference for remote rather than common associates (Houston and Mednick, 1963) and have more "liberal" viewpoints on social issues (Kowalski, 1960).

It is relevant to note that although the RAT has been related to a number of criterion measures, other studies have not succeeded in finding relationships with predicted criteria (Andrews, 1965; Karlins, 1967). Also, Bower and Clark (1968) reported low correlations between RAT scores and other creativity measures, and high correlations between RAT scores and measures of intellectual functioning. Similarly, Taft and Rossiter (1966) found lower correlations between RAT scores and a set of Guilford's measures of divergent thinking (purportedly central to creative ability), than between RAT scores and measures of intelligence and achievement.

In regard to such findings, Ginsburg (1970) has stated:

> The RAT appears to be an interesting test which can be related to many variables (although not always as predicted) . . . but nevertheless . . . we seem to be left with the question, 'What does the RAT measure' (p. 278).

These negative results are hardly surprising, since, as was noted earlier, all available tests of creativity have yielded contradictory and inconclusive results. (See Dellas and Gaier, 1970). In fact, to this writer's thinking, it is surprising that the RAT, which is merely associational (rather than logical or conceptual in nature) has had such frequent success in distinguishing between creative and non-creative individuals across varying fields of endeavor. Even those writers who have criticized the RAT in terms of its moderate and positive relationship to verbal intelligence, have noted its surprising predictive success. Ginsburg (1968), for example, who demonstrated that the RAT is positively and linearly related to verbal intelligence measures, also noted that RAT scores predict well to certain types of performance to which intelligence measures do not predict. He concluded that, ". . . despite the persistent finding of a moderate, positive, and reasonably homoscedastic relationship between RAT and verbal intelligence measures, the two appear to be measuring different (albeit overlapping) abilities" (p. 136).

In part, the equivocal results may stem from the fact that the RAT has been conceptualized as a test of "creative potential" without any attempts made to specify what aspects of creativity it may be tapping. Whereas Mednick may be correct in his assumption that all creativity involves the bringing together of seemingly

remote elements, the skills involved in so doing may vary in varying fields of creative endeavor. That is, it would not be particularly surprising to find that the RAT, which deals only with word associations, was unrelated to the ability to find the mediating connections between remote stimulus elements in mathematics or music. Karlins (1967), who found no relationship between RAT performance and skill on a complex problem solving task, stresses the fact that his negative results in no way suggest that the remote associative model is an inappropriate way to view creativity. Rather, he suggests that the problem solving tasks in his experiment did not tap skills possessed differentially by individuals varying in associative creativity. With an increasing understanding of the cognitive skills underlying effective RAT performance, we will be better able to specify what types of creative potential the RAT can reasonably be expected to predict.

Other writers have argued that the RAT is an instrument which is deserving of research attention in its own right, apart from its relationship to creativity (Ginsburg and Hood, 1970). Understanding individual differences in RAT performance, independent of any relevance to creativity research, may add to our understanding of important aspects of cognitive functioning, such as associative behavior.

RAT Performance and Individual Differences in Attention Deployment: Breadth of Attention

Studies investigating the relationship between RAT performance and individual differences in attention deployment have mainly concerned themselves with extensive aspects of attention deployment,

that is, the number of cues or amount of information an individual can attend to or utilize (breadth of attention). The literature suggests that high RAT scorers are characterized by relatively greater attentional breadth in terms of their ability to utilize a greater number of cues in problem solving tasks, and in particular, in terms of their access to a greater number of associative elements on word association tests. As was noted earlier, the ability to generate a large number of associations is considered by Mednick to be an important ability that serves to bring otherwise mutually remote ideas into contiguity, thus facilitating a creative solution.

In discussing the concept of attentional breadth it is necessary to distinguish among varying meanings of this term (c.f. Wachtel, 1967). One meaning refers to the range of stimuli sampled and is usually called scanning (Gardner, Holtzman, Klein, Linton, and Spence, 1959). Greater scanning in high RAT scorers has been inferred by their higher scores on incidental learning tasks (Laughlin, 1967; Laughlin, Doherty, and Dunn, 1968), and their greater ability to utilize peripheral and incidental cues in problem solving tasks. For example, in a study of Mendelsohn and Griswold (1964) subjects of 3 levels of creativity (as assessed by RAT performance) were given a list of 25 words to memorize under interference conditions (another list of 25 words played on a tape recorder) prior to solving anagrams. Unknown to the subjects 10 anagram solutions had been in the memorized list (focal incidental cues). Only High RAT scorers showed an increment in solutions

involving the peripheral cues, and high > middle > low creative ss utilized both the focal and peripheral incidental cues ($p < .05$). The authors suggest that among other factors, high RAT scorers may deploy their attention more widely so that they take in a broader range of stimulus information at the stage of stimulus reception.

More recent research by Mendelsohn and Lindhom (1971) demonstrates that deployment of attention to incidental cues is not a critical factor that distinguishes high and low RAT performance, but rather, regardless of the nature of cue presentation high RAT individuals have a greater ability to ". . . acquire and store in an accessible fashion, a relatively wide range of the available stimulus information". They suggest that scanning, in terms of the range of stimuli sampled, may be less important than, "the ability to maintain in awareness a large number of stimulus elements, ideas, or associations at a given point in time" (Mendelsohn and Griswold, 1966, p. 430).

While these authors focus exclusively on the notion of breadth of attention as an explanatory principle underlying the differential performance of high and low RAT scorers, one should note that their research is not definitive in this regard. Differences in the manner in which information is stored which would effect its availability at the time of problem solving, as well as individual differences in sensitivity to priming, could also account for their findings.

Studies investigating the associative behavior of high and low RAT scorers demonstrate more clearly that RAT performance is

related to greater attentional breadth in terms of associative productivity. Mednick (1962) for example, found that high RAT scores were related to associative response availability as measured by a 60 second continued association test. A subsequent study by Mednick, Mednick, and Jung (1964) in which subjects gave continued associations for two minutes also suggested that high RAT scorers have more word associations available. Similar results are reported by Craig and Manis (1960) who administered the RAT to 38 college students along with a timed task requiring subjects to write as many associations as possible to each of 20 words. Again, a significant correlation of .38 ($p < .01$) was found between number of associations and RAT scores. Based on word association tests suggesting that high RAT individuals show greater associative productivity, Mednick and Mednick (1967) have made the following summary statement:

> . . . highly creative persons have been shown to have richer associative lives than less creative persons. They can produce a greater number of associations to a wide variety of stimuli. They also show associative endurance; their rate of idea production does not drop off as rapidly as it does for the less creative individual. In addition their ideas are . . . less dominated by a single track. Further, their associations are likely to vary from occasion to occasion. (p. 10)

The finding that high RAT scorers have access to a broader range of associative elements is certainly not surprising or unexpected. However, Mednick's quantitative interpretation of association theory which stresses that the "sheer number of associations" (Mednick, Mednick, and Jung, 1964, p. 511) is a major factor differentiating high and low RAT individuals has rightfully been

criticized by a number of investigators as simplistic (Jacobson, Elenewski et al., 1968). Mednick (1962) in noting that the correlation of the RAT with associative quantity is only .44, also commented that RAT facility cannot be completely explained by the ability to give a large quantity of associative responses. It is unclear, however, how Mednick's theory would account for individual differences in RAT scores among individuals who do not vary in their ability to generate associations. Mednick (1962) speculates that the ability to recognize the creative combination (that is, the correct RAT answer) when it appears may be another important factor, however, this hardly sheds light on the processes which underlie the attainment of the creative response to be recognized.

RAT Performance and Selective-Inhibitory Control of Attention

While Mednick has considered extensive aspects of attention deployment (in terms of the number of continual associations an individual can generate) to be of central importance in regard to RAT performance, he has not considered the possibility that RAT performance might relate to selective aspects of an individual's attentional style. As was stated earlier, S.I.C. refers to an individual's ability to selectively direct attention to a task at hand, while being able to "filter out" or inhibit responding to irrelevant, misleading or distracting cues.

Perhaps one reason why Mednick has not assumed that S.I.C. of attention is of relevance to performance on his creativity test is that creative ability has frequently been equated with a loose, distractable style of attention deployment that involves a

relinquishing of conscious direction and control of attention (Ghiselin, 1952). This point of view is most clearly expressed by the philosophy of the Dada and Surrealist movements which expressed contempt for rational controlled thinking and suggested that creative efforts were achieved by abandoning oneself entirely to the unconscious and the mentality of the dream (Rubin, 1968). The Dada poet Pierre Reverdy, who believed that creativity comes about through the total abandonment of controlled and directed attention, conceptualized the creative process in terms that are strikingly similar to Mednick's: (In Walberg, 1965)

> The image is a pure creation of the spirit. It cannot be born of a comparison but of the bringing together of two realities which are more or less remote. The more distant and just the relationship of these conjoined realities, the stronger the image -- the more emotive power and poetic reality it will have. (p. 22)

To the artists and poets of the Dada and surrealist movement, "control" of attention was an anethma to the process of bringing together "remote realities" and not surprisingly, they paid special attention to the work of the mentally ill, while turning their own attention to plumbing the depths of the unconscious (Walberg, 1965).

There are others as well, who believe not only that creativity involves the capacity to relinquish controlled and directed attention, but that creative individuals characteristically (if not unwillingly) function in a more distractable and "uncontrolled" manner (Bush, 1968). In regard to RAT performance, certain researchers have suggested that high RAT individuals may indeed be characterized by relatively poor S.I.C. of attention and

analogies have been drawn between the ability to form remote associations and schizophrenic-like thought processes (Libby, 1970). For example, Libby (1970) has speculated that high RAT scorers (and creative individuals in general) may be characterized by habitual fluctuations of attention that are relatively immune to voluntary control. In a reaction time experiment using irregular preparatory intervals, he found that good remote associators (High RAT individuals) had more variable reaction times and were more responsive to misleading cues provided by the previous preparatory interval. Libby concluded that good remote associators may habitually pay more attention to peripheral or seemingly irrelevant cues than poor remote associators who are assumed to be better able to voluntarily focus attention constantly on task relevant cues. He concludes that the high RAT scorers reveal a response pattern which is similar to schizophrenic patients in that they have relatively greater difficulty establishing a set to respond.

Ginsburg and Hood (1970) have also suggested that high RAT scorers tend to discriminate less between focal and nonfocal events, or central and incidental occurrences, and that these individuals are more susceptible to confusion or interference. Although their speculations are not backed by sound empirical data, it seems plausible that high RAT scorers may be more prone to interference because of a larger set of competing responses of equal response strength.

There is another area of research that can also be interpreted as suggesting that high RAT scorers might be characterized

by relatively poor S.I.C. of attention, and that is the work of Callaway and his colleagues (Callaway and Stone, 1960) which suggests that good selective attention is a concomitant of a reduced range of cue utilization. These investigators found that experimental manipulations which resulted in a narrowing of attentional breadth (in terms of number of cues utilized) also resulted in increased effectiveness on selective attention tasks (Callaway, 1959; Callaway and Stone, 1960). Experimental findings suggesting that an increased ability to resist distraction is associated with a narrow range of cue utilization, lends indirect support to the notion that poor RAT individuals (with their less number of associative elements) may be relatively more adept at resisting distracting and interfering stimuli, than high RAT scorers.

It is this writer's speculation, however, that good S.I.C. of attention is positively related to RAT performance, and that without the capacity to selectively direct and control attention, and to resist responding to compelling cues, good RAT performance will not be achieved. This is not to suggest that high RAT scorers (and creative individuals in general) are not more adept at relinquishing conscious controls and directives, and adopting a loose, free-floating and "distractable" attentional style. But this capacity for passive, receptive, and free ranging attention should not be considered to be a pervasive and stylistic mode of attention deployment which is incompatible with effortful, controlled, and directed thought.

Although we have noted that good RAT performance has been equated in the literature with relatively poor S.I.C. of attention,

there are also studies which may be interpreted as supporting this writer's point of view. Gamble and Kellner (1968) found that high RAT scorers performed better than low RAT scorers on the Stroop Color Word Test, in which successful performance demands the ability to inhibit responding to salient and overlearned (but misleading) cues. Although these authors conceptualize the Stroop test as a measure of "adaptive regression" and do not discuss their results in terms of selective attention, their findings support the present writer's hypothesis, that RAT performance and S.I.C. of attention are positively related.

Indirect support for this author's hypothesis also comes from a study by Riegel, Riegel and Levine (1966) who gave one free association task and 13 restricted association tasks (using the same stimulus words) to 24 high creative individuals and 24 low creative individuals. The criteria for selecting these groups was based on performance on the Creative Personality Scale (CPS), which has been shown to have high agreement with the RAT (Walker, 1962). In counting the number of times that a subject gave identical responses to the same stimulus under both the free associative condition and any one of the 13 restrictive instructions, it was found that high scorers on the CPS demonstrated much greater independence from their free associations than did low scorers. Similarly, for each stimulus condition, low scorers were more apt to repeat a response under two different task instructions. These authors conclude that high creative subjects have a "more differentiated conceptual structure" and that the

restricted associations of low creative subjects are less well controlled. It is possible to interpret these results as suggesting that high CPS scorers (and by inference, high RAT scorers) are better able to "tune out" initially dominant associations when the task demands it.

But on what theoretical grounds might it be predicted that RAT performance is positively related to S.I.C. of attention? To this writer's thinking, the ability to tune out compelling and overlearned cues may be a critical skill underlying effective performance on this test. For if an individual cannot resist distraction from compelling cues, he may get "fixed" on a few salient stimuli and fail to gain access to a wide range of associations. In other words, greater "associational breadth" and a "flatter associative hierarchy" may be related to, or dependent upon, the ability to "tune out" and resist distraction from salient associations, ideas, and the like. To the extent that an individual is "captured" by salient stimuli or overlearned associations, he may be impaired in his ability to gain access to remote associations.

Perhaps it would be useful to look carefully at one RAT item in order to further speculate how S.I.C. of attention might facilitate performance on this test:

1. break train battle

The correct answer to this item is station. One might speculate on the response process as follows. It is not unlikely that the individual attempting to solve this item might begin by trying

to associate to the dominant meaning of the word break (e.g. smash, hit, etc.) Similarly, the word train, because it occurs contiguously with the word battle, might initially elicit associates such as drill, instruct, etc. In any case, because the answers to RAT items are frequently not readily available associates to any of the three stimulus words, most subjects are likely to start off on the "wrong track". What is called for then, is not so much the capacity to give many associates, or even remote associates, but rather the capacity to inhibit an initially dominant line of thought ahd shift to a different associative track -- perhaps then to inhibit that line of thought and again shift to a different "set". Without the capacity to inhibit or tune out ones initial set to respond -- that is, to control and direct ones attention away from an initial dominant line of associations -- the correct response may not be obtained, although the "sheer number of associative elements" in Mednick's terms, may be very large.

It is possible to argue, however, that the "flexibility" described above is not the outcome of good S.I.C. of attention. In fact, those writers who have associated good RAT performance with poor selective attention might present a contrary argument. They might speculate, for example, that it is the high RAT scorer's debility in S.I.C. of attention that underlies such "flexibility" or variability of response. That is, one could argue that it is the high RAT scorer's difficulty in maintaining a set, his problem in distinguishing between focal and peripheral cues, and his

general lack of controlled and directed attention, which allows him to rapidly shift his attention across varied associative lines.

Hypotheses

To test the hypothesis that the RAT is positively related to S.I.C. of attention, two tasks were included in the present study, each of which requires the ability to inhibit responding to obvious and compelling stimulus attributes, i.e. to avoid distraction from conflicting or misleading cues. Since the RAT is an associative test, the author wished to include a task which would measure an individual's ability to "tune out" or resist distraction from compelling word associations. Because there is no such test available, a test was constructed which demands the ability to resist distraction from salient word associations and compelling contextual cues. The relationship between this test, which the author called the Associative Distraction Test (ADT) and the RAT, is the focal point of the present study. If indeed high RAT individuals are more distractable and less able to inhibit responding to compelling task irrelevant cues, poor performance on the ADT should be associated with higher RAT scores. On the other hand, if the author is correct in the assumption RAT performance and S.I.C. of attention are positively related, then scores on the two tests should reflect this predicted relationship.

The author also included a non-verbal selective attention task, the Speed of Color Discrimination Test (SCDT) which is a modified group version of the Stroop Color Word Test. In this test effective performance demands that the individual resist distraction from compelling but misleading visual cues. Color

names are written in different colored inks (e.g. the word blue is printed in red ink) and the person is requested to name the color of the inks while ignoring the conflicting printed word.

There are several reasons for including the SCDT in the present study. For one thing, it is an attempt to replicate an earlier study by Gamble and Kellner (1968) which reports a positive relationship between RAT performance and scores on the Stroop Color Word Test ($F=6.52$, df $1/44$ $p < .05$). Another reason for using two tests of selective attention is to allow for an assessment of individual consistancies in attention deployment over different modalities. In light of the research regarding cognitive controls and styles (Gardner et al., 1959), one would predict that performance in selective attention tasks would be consistant over a broad range of functioning and a variety of task demands. The inclusion in the present study of two tasks of selective attention allows for a test of the hypothesis that good (or poor) selective attention in the cognitive mode (ADT) will be related to good (or poor) performance in the perceptual mode (SCDT).

The SCDT was also included in the present study in order to assess whether RAT performance is related to an ability to inhibit responding to compelling but misleading cues which are not associational or verbal in nature. Put another way, the inclusion of the SCDT allows for a test of this author's hypothesis that RAT performance may be related to a general ability to inhibit responding to distracting cues, even when these interfering stimuli are not associational in nature.

The hypotheses of the present study are as follows:

I. Effective RAT performance is related to the ability to tune out and inhibit responding to compelling and overlearned associations and contextual cues. In terms of the experimental procedure, it is predicted that RAT scores will be positively related to ADT scores.

II. RAT performance is related not only to the ability to tune out compelling word associations and contextual cues, but to a more general capacity to selectively direct attention to a task at hand, while resisting the effects of interfering stimuli. Thus it is predicted that RAT and SCDT scores will be positively related.

III. There will be a significant correlation between the two selective attention tasks (the ADT and SCDT). Although the ADT is a cognitive test in which the interfering stimuli are associational or verbal in nature, and the SCDT is a perceptual test involving conflicting visual cues, they are both tasks which require inhibition of compelling and misleading task irrelevant cues. It is hypothesized then, that individuals manifest some consistancy in their capacity to tune out disrupting and contradictory cues, regardless of the nature of the interfering stimuli.

Description of Tests Administered

The ADT is a new test designed by the author to measure an individual's ability to inhibit responding to salient and interfering

verbal associates and contextual cues. Effective performance on this task involves the ability to tune out and resist distraction from compelling contextual cues and word associations.

Each item contains a multi-meaning word in a sentence containing sufficient contextual cues to clarify which meaning is being suggested. The subject must then select from four words the one which is an associate of the alternate meaning of the word which is not suggested by the sentence. Two test items are:

1. The precious diamond is missing!

   a. ring b. gas c. flower d. spade

2. He stood by the pit.

   a. split b. hole c. sat d. peach

Choice d is the correct answer for the above items.

When the ADT was first constructed each test item contained four response choices which included the correct response (the associate to the alternate meaning of the underlined word), one clang associate to the double meaning word, one associate to the dominant meaning of the word (the meaning suggested by the contextual cues) and one irrelevant association. Pilot work demonstrated that the items were not difficult enough when presented in this manner and did not ensure a wide range of scores. A number of attempts were made to construct more difficult items and pilot work suggested that this could best be done by varying the types of incorrect or distracting choices for each item. Thus, one will note that item 1 includes, along with the correct response (d): one associate to the dominant word meaning (a); and

two irrelevant associations (b and c). Item 2 includes, along with the correct response (d), one clang associate (a), one associate to the dominant word meaning (b), one associate to the dominant contextual cues in the sentence (c -- sat is an associate to stood).

The placement of the correct response was randomized for all items.

The test is administered aurally in a group and each item is read aloud by the tester with a 3 second pause between items. First the double meaning word is read alone, followed immediately by the sentence and the four alternatives. Some of the double meaning words are homophones and the subjects are informed in the instructions that this will be the case for certain items.

Subjects indicate their answers on an answer sheet which lists only the alternate words for each of the 40 items. The sentences which provide the contextual cues are not included in order to insure that subjects do not go back and work on previous items or spend too long a time on a particular item.

All subjects receive printed test instructions which are read aloud to them by the examiner. Test instructions and practice items ensure that all subjects understand the task demand. In case of any ambiguity, subjects are encouraged to ask questions if they are not certain that they understand the test requirements. Also, each multi-meaning word in the ADT is sufficiently simple to ensure that subjects would recognize each meaning of the word if encountered in the appropriate context and be able to make the correct associative connection (See ADT Control in Appendix).

Subjects were scored for the total number of items correct. The highest possible score is 40.

Some Notes on the Construction of the ADT

The ADT is purportedly a test to measure an individual's ability to resist distraction from compelling misleading contextual cues and dominant associations. In part, its validity rests on the assumption that errors can be explained purely by an "interference" hypothesis. Errors should not be due to poor vocabulary, or an inability to recognize culturally common word associations.

Consider the first test item of the ADT:

1. This is a rare occasion.

   a. jewel b. steak c. event d. stick

It is assumed that if there were no associative distractions or misleading conceptual cues, each subject could make the correct associative linkage between the underlined word and the associate of the alternate meaning (in this case "rare-steak"). To test this assumption for each item, a control test was constructed using the same double meaning words, and including among the alternate response possibilities, the same "correct" associate to the alternate meaning word. In the control test, however, the contextual cues of the sentence suggested the alternate meaning of the word and the response alternatives did not include any conflicting associates to the other meaning. For example, on the control form Item 1 reads:

1. I prefer it rare.

   a. mouse b. steak c. yellow d. grass

This form of the test was administered aurally to 36 undergraduate psychology students at San Fernando Valley State College in precisely the same manner as the ADT. Instructions were to choose from the four alternatives, an associate to the double meaning word that was suggested by the context of the sentence. Subjects were informed that they were part of a project involving test-construction and that the examiner wished to know if any of the associate pairs (e.g. rare-steak, tip-advice) were not strong ones. Thus, subjects were told to leave any item blank if there were no easily recognizable associates to the multi-meaning word. If more than one subject missed an item (or left it blank) it was eliminated from the test.

As a further check, the revised Control Test (Appendix) was administered to 28 undergraduates at the University of California, Berkeley. There were no errors made by any students.

Ideally, established word association norms such as those established by Palermo and Jenkins (1964) would have been used as the correct response items in the ADT to ensure that the item answers were common associates for a college population. Because the ADT required the use of double meaning words, this was not possible, however, the control test demonstrates that the associates used in the ADT are common ones which are readily available to a college population in the absence of distracting and misleading cues.

Reliability coefficients for the ADT were computed by the split half method, the correlation between the two ADT half tests, odd and even items, was .757. Applying the Spearman-Brown prophecy

formula, the reliability coefficient is .862. A more stringent test of reliability, the Kuder Richardson (D-R 20) was computed yielding a reliability coefficient of .867. The high internal consistancy of the ADT suggests that it is measuring a unitary attribute of subjects.

Speed of Color Discrimination Test (SCDT)

The SCDT is a modified version of the Stroop Color Word Test. The Color Word Test was introduced in this country by Stroop (1935), was first used by Jaensch et al. (1929) and was later modified by Thurstone (1944). It is an individually administered test which consists of the names of colors printed in inks of conflicting colors, that is, the word r-e-d is printed in yellow, green, blue, and purple inks. Subjects are instructed to read off the colors of the ink as rapidly as possible, ignoring the printed words. Effective performance demands the ability to "tune out" and resist distraction from the compelling, overlearned stimulus of the written words.

The SCDT is a group-administered instrument which is similar to the Color Word Test. The test consists of two parts, each with four separately timed subparts. In part I, test items consist of samples or patches of four different colors, red, blue, green, and orange, and the subject must print under each color the first letter of the color name (R would be printed under a patch of red). Part I of the ADT provides a measure of speed of color discrimination under normal conditions.

In the second part of the SCDT, color names are printed in different color inks, i.e. the word red is printed in blue, green, and orange inks. Subjects are instructed to write the first letter of the color in which conflicting color names are printed (e.g. a subject would write R if the word green is printed in red ink).

The test is highly speeded and fifty seconds are allowed for each of the eight sub-parts. No test Manual, scoring instructions, or other information about the test is provided for E with the test-booklets. Instructions are printed in each testbook and were read aloud by E before beginning the test. Answers are printed in the test booklet. Subjects received a score for the total number of items correct in Part I, which provides a measure of speed of color discrimination under normal conditions. Subjects also received a score for the total number of items correct on Part II which provides a measure of speed of color discrimination under interference conditions.

In obtaining a measure of interference for each subject, researchers have traditionally used the algebraic increment or difference score (termination level minus initial level) which contains both logical and statistical problems which have been discussed in detail by Sargent, Coyne, Wallerstein and Holtzman (1964). The most obvious difficulty stems from the fact that a subject starting with a high initial level on color naming (Part I) has little room in which to increase and thus, his increases should be given proportionally more weight than an increase for a S who started with a very low initial level. The residual change

score used in the present study takes into account the problem of initial level and is the correct statistical procedure for obtaining a true measure of interference. Its method of computation as well as its theoretical rationale have been discussed in detail by these authors (p. 287, 288).

Mednick's Remote Associates Test (RAT); Form I

A description of this test including reliability and validity data, as well as standard instructions, has been presented by Mednick and Mednick (1967) in their Examiner's Manual.

In the RAT, the subject is presented with three words and asked to find a fourth word which is an associate to all three. One sample item is:

1. cookies sixteen heart _____

Here the answer is "sweet". Cookies are sweet, sweet is part of the phrase "sweet sixteen" and part of the word "sweetheart".

There are thirty items in all. Although this is not a speed test, Mednick has established a 40 minute time limit. In the present study, it was necessary to establish a 30 minute time limit for all ss. Subjects were scored for the total number of items correct. The highest score that can be achieved is 30.

Research by Mednick and Halpern (1969) has indicated that even when test time for the RAT is reduced to 15 minutes, there are high correlations (.780) between these RAT scores, and RAT scores obtained in the 40 minute administration. Test performance in the first 30 minutes was more highly related to what was achieved in 40 minutes (pearson r = .866) and similarly, it is reported that

increases in time limit to as much as an hour have not resulted in significant score differences. In the present study, all ss reported that they had a chance to try each RAT item at least twice.

Vocabulary Test

The abbreviated form of the Wechsler vocabulary test used in the present study consists of 20 items from the WAIS vocabulary subtest. Information regarding reliability, validity, and scoring norms is presented by Jastals and Jastals (1964). Items were scored in accordance with the instructions presented by these authors. The highest score an individual may achieve is 40.

Design and Method

Subjects

The subjects in this study were 85 sophomore undergraduate students, 41 males and 44 females who were enrolled in three Social Psychology courses at San Fernando Valley State College in Northridge, California. Individuals who were color blind, or whose native language was not English, were eliminated as subjects before testing began.

There were no reported differences in age, background, or level of education among students in the three classes. Participation in this experiment was a course requirement for all subjects.

Data Collection

Testing involved two separate sessions for each of the three classes involved. Prior to testing, subjects were informed that they were participating in a research study regarding "concentration and attention" and were told that their questions about the experiment would be discussed after all tests were administered.

During the first testing session which took a full class period, the ADT, SCDT and the RAT were administered respectively. During the second testing session each subject filled out a shortened form of the WAIS vocabulary subtest (Jastals and Jastals, 1964) as an estimate of intellectual functioning or verbal ability. This test was administered so that it would be possible to control for the effects of verbal ability in examining the relationship between RAT and ADT scores. Also, the vocabulary

subtest has been demonstrated to be the best single predictor of Full Scale I.Q. (Terman and Merill, 1960; Wechsler, 1958).

Because the tests were not given to the three groups of subjects in a varied order, there is the possibility that order-effects (e.g. fatigue, loss of interest, etc.) are present and unknowable. It should be noted, however, that since the ADT and SCDT are relatively short tests (8 and 15 minutes respectively) it is unlikely that factors such as fatigue would be appreciatively operative during the RAT which is not a speeded or high powered test. One might also argue that since any possible effects were the same for all Ss, it is unlikely that this would influence the relationships obtained. Still, it would have been preferable to counterbalance the tests given in order to ascertain whether order effects are, in fact, present.

Data Analysis

TABLE 1 presents the means and standard deviations for males, females, and all subjects on the ADT, RAT, SCDT and Vocabulary tests.

TABLE 1

Means and Standard Deviations for All Tests

	Males N = 41		Females N = 44		All Subjects N = 85	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
ADT	33.51	4.66	34.34	6.05	33.94	5.41
RAT	12.24	4.62	14.91	4.39	13.62	4.67
SCDT (residual interference score)	227.40	19.08	226.92	21.11	227.15	20.04
VOCAB.	28.00	5.72	30.20	5.42	29.14	5.64

Although it was initially planned to use correlational techniques to test all three hypotheses, the assumptions for this statistical procedure was violated by the fact that the ADT scores had a Poisson distribution. One can see from Figure 2 that scores on the ADT form a highly skewed J curve, with the majority of subjects clustered at the upper end of the distribution. For this reason, Hypotheses I and III were tested by dividing subjects into High, Medium and Low ADT groups and conducting an exact univariate analysis of variance using the number of correct RAT items and

SCDT interference scores as dependent variables (Bancroft, 1968, pp. 16-24).

Figure 2

Distribution for ADT

Class Interval	All Ss.	Males	Females
36 - 40	45	18	27
31 - 35	21	11	10
26 - 30	13	9	4
21 - 25	3	3	0
16 - 20	2	0	2
11 - 15	0	0	0
6 - 10	1	0	1
0 - 5	0	0	0
E	85	41	44

The three ADT groups were divided in the following manner: High ADT (Group I) consisted of ss who achieved scores from 36-40 (n = 45); Middle ADT (Group II) achieved scores from 31-35 (n = 21); Low ADT (Group III) achieved scores from 0-30 (n = 19). The means and standard deviations of ADT scores for each group is presented in TABLE 2

TABLE 2

Mean ADT Scores for the Three ADT Groups

ADT Grp.		N	$\bar{X}$	S.D.
I	M	18	37.67	1.3284
	F	27	37.48	2.0638
	E	45	37.56	1.7908
II	M	11	33.36	1.2060
	F	10	33.40	1.2649
	E	21	33.38	1.2032
III	M	12	27.42	2.4664
	F	7	23.57	7.7429
	E	19	26.00	5.2281
Total	M	41	33.51	4.6590
	F	44	34.34	6.0461
	E	85	33.94	5.4058

These unequal groupings were necessitated by the fact that a great number of subjects, in fact, obtained very high scores on the ADT, and thus should be grouped together. Since 36-40 was already a very limited range as compared to 0-30, it was felt that this ADT group could not be further subdivided even though it contains twice as many ss as the middle ADT and Low ADT groups which are approximately equal in size.

Hypothesis I. Effective RAT performance is related to the ability to tune out and inhibit responding to compelling and overlearned associations and contextual cues. In terms of the experimental procedure, it is predicted that RAT scores will be positively related to ADT scores.

To test the relationship between ADT and RAT scores, a univariate analysis of variance of the number of correct RAT items was conducted. The factors were ADT groups (I, II, III) and Sex (Male and Female). One can see from TABLE 3 that both

TABLE 3

Analyses of Variance of RAT Scores

		RAT		
AØV	MS	DF	F	P
G (elim. S)	85.337	2,79	4.904	.010
S (elim. G)	94.590	1,79	5.436	.022
G x S	68.917	2,79	3.960	.023

of the main effects were significant for ADT groups ($F = 4.904$, $df = 2/79$, $p < .01$) and for sex ($F = 5.436$, $df = 1/79$, $p < .022$). A significant interaction was also obtained ($F = 3.96$, $df = 2/79$, $p < .023$). Figure 3 presents the mean correct RAT solutions for the three ADT groups for each sex.

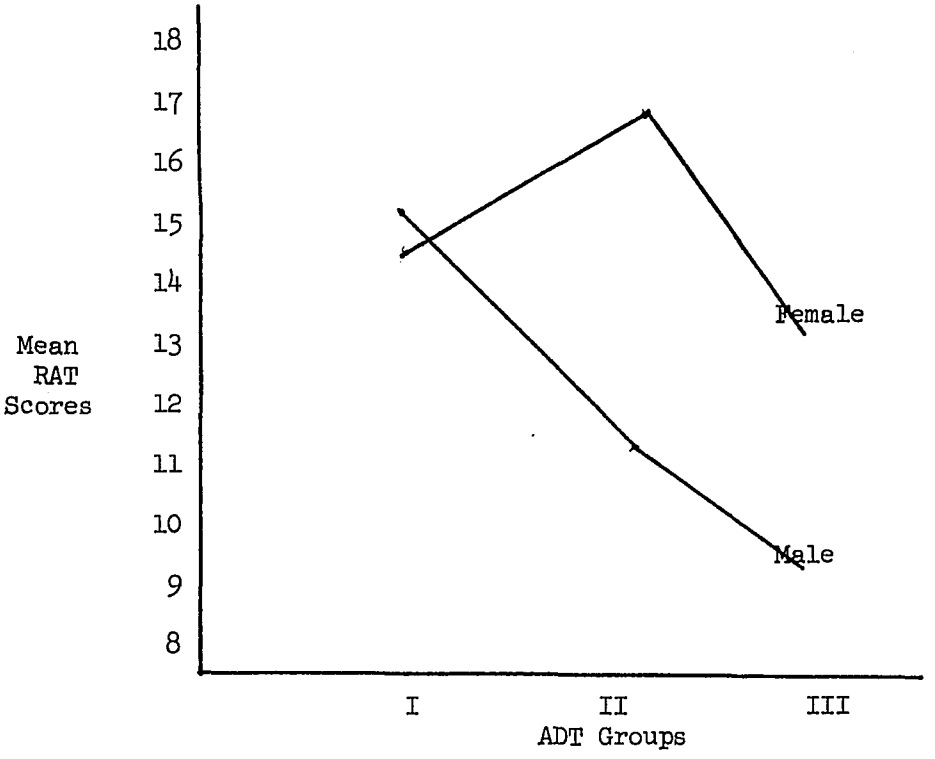

Figure 3

Mean Correct RAT Scores for Three ADT Groups

To control for the effects of verbal ability an analysis of covariance was conducted using vocabulary scores as the covariate. Table 4 indicates the results obtained from this analysis and it is evident that both the main effects, Groups and Sex, as well as their interaction, lose in significance ($F = 2.705$, $df = 2/78$, $p < .073$; $F = 3.823$, $df = 1/78$, $p < .054$; $F = 2.771$, $df = 2/78$, $p < .069$, respectively). It is evident that a sizeable portion of the relationship between the ADT and the RAT is due to their shared variance with vocabulary.

TABLE 4

Analysis of Variance of RAT Scores
With Vocabulary Controlled

Vocab. as Covariate

	RAT			
ACØV	MS	DF	F	P
G (Elim. S)	41.957	2,78	2.705	.073
S (elim. G)	59.316	1,78	3.823	.054
G x S	42.987	2,78	2.771	.069
Within-Cells Regression	164.628	1,78	10.612	.002

Because of the significant Group X Sex interaction the results were analyzed further for each sex. For females the results of a univariate analysis of variance of RAT items indicated that the ADT Group effect was insignificant ($F = 1.457$, $df = 2/41$, $p < .245$) and the results remained insignificant when vocabulary scores were covaried out ($F = 1.428$, $df = 2/40$, $p < .252$). For females then, there is no relationship between ADT and RAT scores and thus, the first hypothesis is not supported for this sex.

For males, however, a univariate analysis of variance of RAT items yielded a highly significant ADT Group effect. ($F = 8.025$, $df = 2/38$, $p < .001$). To investigate further, non-orthogonal comparisons were run for the High vs. Middle ADT Groups and the

Middle vs. Low ADT Groups. The results for the High vs. Middle Groups were significant ($F = 6.42$, $df = 1/38$, $p < .016$). The results for the Middle vs. Low ADT Group did not reach significance ($F = 1.232$, $df = 1/38$, $p < .274$).

Controlling for the effects of vocabulary, an analysis of covariance was conducted using vocabulary scores as the covariate, and a significant ADT Group effect was still obtained ($F = 4.377$, $df = 2/37$, $p < .020$). The results of the non-orthogonal comparisons, controlling for vocabulary, yielded significant results for the High vs. Middle ADT group ($F = 3.873$, $df = 1/37$, $p < .057$) and insignificant results for the Middle vs. Low ADT Groups ($F = 0.890$, $df = 1/37$).

For males then, the hypothesis suggesting a positive relationship between RAT and ADT scores is supported. Although the results of the covariance analysis demonstrate that a good portion of the relationship between these two tests is due to their shared variance with vocabulary, the relationship is still significant ($p < .020$) when the effects of vocabulary are accounted for.

TABLE 5 presents the Mean RAT and Vocabulary scores for the three ADT Groups.

TABLE 5

Mean RAT and Vocabulary Scores
for Three ADT Groups

			RAT		Vocab.	
		N	X	S.P.	$\bar{X}$	S.P.
I	M	18	14.94	4.4914	30.83	4.2875
High	F	27	14.70	4.0460	30.56	5.9052
ADT	E	45	14.80	4.1811	30.67	5.2657
II	M	11	11.09	3.7001	26.64	7.0324
Middle	F	10	16.70	4.8774	30.30	5.2504
ADT	E	21	13.76	5.0784	28.38	6.3755
III	M	12	9.25	3.3063	25.00	4.5527
Low	F	7	13.14	4.7409	28.71	3.9036
ADT	E	19	10.68	4.2302	26.37	4.5972
E	M	41	12.24	4.6194	28.00	5.7184
	F	44	14.91	4.3925	30.20	5.4242
	E	85	13.62	4.6726	29.1412	5.6445

Apart from the fact that the relationship between ADT and RAT scores is significant for males only, other sex differences emerge in the present study. Although the Pearson product-moment correlation between RAT and Vocabulary scores is significant for each sex (for males, $r = .42$, $df = 39$, $p < .01$; for females, $r = .44$, $df = 42$, $p < .01$; for all Ss, $r = .46$, $df = 83$, $p < .001$), the

Within-Cells Regression which measures the relationship between RAT and Vocabulary scores when ADT Group membership is accounted for, is highly significant for females, ($F = 9.567$, $df = 1/40$, $p < .004$), and insignificant for males ($F = 2.065$, $df = 1/37$, $p < .159$). This means that for males, a great deal of the .42 correlation between RAT and vocabulary scores is enhanced by ADT group differences. For females, however, there is a highly significant relationship between RAT and Vocabulary scores, which is not reduced when ADT group differences are taken into account.

Further, there is a significant relationship between ADT and Vocabulary scores for males only. TABLE 6 shows the results of a univariate analysis of variance of the vocabulary scores with ADT Group and Sex as factors, in which the ADT Group main effect was significant.

TABLE 6

Analysis of Variance of Vocabulary Scores

		Vocab.		
	MS	DF	F	P
G (elim. S)	105.884	2,79	3.667	.030
S (elim. G)	51.982	1,79	1.800	n.s.
G x S	40.074	2,79	1.388	n.s.

When the analysis was done for each sex, the ADT Group effect was significant for males ($F = 5.011$, $df = 2/38$, $p < .012$) but not for females ($F = 0.312$, $df = 2/41$).

For females, then the only pattern of relationship which emerges is a highly significant relationship between Vocabulary and RAT scores. For males, the three verbal tasks (Vocabulary, RAT, and ADT) are each interrelated; Vocabulary skill accounts for a portion of the significant relationship between ADT and RAT scores, and ADT Group membership accounts for most of the relationship between RAT and Vocabulary scores.

Another sex difference in the present study is the higher RAT scores of females. There are no sex differences in ADT or Vocabulary scores.

Hypothesis II. RAT performance is related not only to the ability to tune out compelling word associations and contextual cues but to a more general capacity to selectively direct attention to a task at hand, while resisting the effects of interfering stimuli. Thus it is predicted that RAT and SCDT scores will be positively related.

The relationship between RAT and SCDT performance was examined by computing the product-moment correlation between these measures. The correlation was not significant for men ($r = .04$, $df = 39$), for women ($r = .234$, $df = 42$) or for subjects combined ($r = .13$, $df = 83$) thus the second hypothesis is not supported.

Hypothesis III. There will be a significant correlation between the two selective attention tasks (the ADT and SCDT).

A univariate analysis of variance was conducted of the SCDT residual interference scores with ADT Groups and Sex as factors. Neither of the F tests for the main effects (ADT group or Sex) nor their interactions approached significance. (See TABLE 7). The finding that there is no relationship between ADT and SCDT performance fails to support the third hypothesis.

TABLE 7

Analysis of Variance of SCDT Interference Scores

AØV	MS	DF	F	P
G (elim. S)	140.746	2,79	0.338	n.s.
S (elim. G)	24.303	1,79	0.058	n.s.
G x S	288.912	2,79	0.693	n.s.

Discussion

Hypothesis I: The Relationship between RAT and ADT Performance: Results for Females

The lack of a significant relationship between RAT and ADT scores for females suggests that for this sex, RAT performance is not related to the ability to inhibit responding to compelling word associations and dominant contextual cues. For females, very poor ADT performance is not associated with lowered RAT scores, and it is apparent that RAT performance, although related to vocabulary skill, is independent of the abilities tapped by the ADT.

The fact that the predicted relationship between RAT and ADT scores was found only for males is in keeping with other reports of substantial male-female differences in many areas of research (e.g. Mendelsohn and Griswold, 1966; Tyler, 1965, pp. 239 ff.). In regard to RAT research, sex differences have proved to be of special importance, and predicted relationships have more often been found for males than females (Mendelsohn and Griswold, 1966; Rainwater, 1964).

Of relevance is a study by Mendelsohn and Griswold (1966) investigating RAT performance and the use of incidental cues in problem solving in which differences were found between males and females in the pattern of cue utilization. For one sample, a strong relationship was found for males between RAT performance and the ability to utilize focal incidental cues in problem solving, whereas no such relationship was found for females. A similar but less pronounced sex difference was reported in a previous study

(Mendelsohn and Griswold, 1964) and the results of the present study are in keeping with other RAT research reporting significant results for males only.

It is important to note, however, that contrary findings have been reported as well. For example, for one sample, Mendelsohn and Griswold (1966) found that the relationship between RAT performance and the utilization of focal incidental cues was significant for females only. The authors conclude, ". . . while there is a greater consistancy of results for males, present data do not allow for a definitive answer to the question of sex differences" (p. 428). Despite equivocal findings, and the lack of a theoretical rationale explaining sex differences, it is clear that researchers involved in RAT research must examine differences between male and female subjects. Research based on only one sex may lead to faulty generalizations, and research that combines the sexes into one subject grouping may obscure significant relationships.

Also of interest in regard to the present findings is the fact that for females, ADT performance is unrelated to vocabulary skills. It is indeed puzzling why these two verbal tasks (ADT and Vocabulary) are highly interrelated for males and not for females. At present, there seems to be no way to make theoretical sense out of this sex difference, especially since the ADT is a new test which has not been independently researched. Perhaps further investigation with the ADT will demonstrate that this test yields different patterns of correlations with other cognitive tasks for males and females, or that ADT performance itself involves different cognitive skills or strategies for the two sexes.

The higher performance of females on the RAT is also difficult to explain on theoretical grounds. One can see by examining the normative data that is presented in the RAT Examiner's Manual (Mednick and Mednick, 1967), that different subject samples have yielded sex differences in RAT performance, but not consistantly or in one direction (pp. 3-5). It does not appear that there are reliable sex differences in RAT performance, but rather that sex differences may occasionally emerge which are perhaps due to unspecified characteristics of a particular sample. In regard to the present study, it may even be possible that the effect of a female examiner may have somehow influenced the higher scores of the female subjects on this test.

Results for Males

The significant relationship between ADT and RAT performance ($p < .020$, with vocabulary scores covaried out) lends support to the hypothesis that for males effective RAT performance (and purportedly creative ability) is positively related to S.I.C. of associative behavior. Subjects who had difficulty in tuning out compelling associations and contextual cues on the ADT, also tended to have lowered RAT scores, suggesting that for males the concepts of control, direction, and inhibition of attention are relevant to effective RAT performance.

It should be noted, however, that good S.I.C. of attention as measured by ADT scores, by no means ensures high RAT performance. The RAT Scores of the High ADT Group ($X = 14.94$) are not particularly impressive when compared to normative data presented by

Mednick and Mednick (1967) ($\bar{X}$ RAT Score 16.02 for University of California students, N = 1036; $\bar{X}$ RAT Score 13.14 for Maryland undergraduate students). That is, the data by no means suggest that the skill required for high ADT performance is a major factor accounting for individual differences in RAT performance.

While good S.I.C. of attention as measured by the ADT is not a sufficient skill to ensure high RAT performance, it may be a necessary one, as suggested by the fact that the medium and low ADT group had very low $\bar{X}$ RAT scores (11.09 and 9.25 respectively) which are not entirely accounted for by Vocabulary skills. This can be interpreted as supporting this writer's theory that if an individual cannot "tune out" and resist distraction from compelling associations and contextual cues, he will get "fixed" or "captured" by associations which are salient for him, and hence, will perform poorly on Mednick's test. It seems then, that the present findings contradict the notion that it is the high RAT individuals who are more distractable, less able to voluntarily maintain the focus of their attention, and less able to delay or inhibit responding to salient stimuli. The results of the present study suggest that for males, difficulty in selective control of attention is associated with relatively poor RAT performance.

Although the relationship between ADT and RAT performance remains significant when the effects of Vocabulary skill are controlled for, it is important to note that a good portion of the relationship between ADT and the RAT is due to their shared variance with vocabulary. Further, the conclusions drawn from the

present study are speculative ones for one obvious difficulty in interpreting the relationship between ADT and RAT scores concerns the fact that the ADT is a new test with unknown validity and reliability. Only further research can determine whether or not the ADT is in fact measuring what it purports to measure, and the possibility exists that other unaccounted for aspects of verbal ability are relevant to successful performance on this test. Although there is no way to demonstrate convincingly from the present data what the ADT is, in fact, measuring, it is worthwhile to discuss this new test in greater detail.

Further Speculations Regarding the ADT

One interesting finding regarding the ADT is that the scores on this test were not normally distributed, but rather had a Poisson distribution with the great majority of subjects clustered at the upper end of the scale. One possible explanation for this skewed distribution is that the ADT is not discriminating between average and above average individuals because the test is not difficult enough. One might speculate that a more difficult version of the ADT might ensure a normal distribution curve, and that the test has failed to include items of sufficient difficulty to discriminate among high scoring individuals.

An alternate possibility is that the ADT is not measuring a skill or ability that is normally distributed in the general population, but rather, that it is discriminating among individuals who have some impairment in S.I.C. of attention, and those that do not. That is, the High ADT group may consist of those individuals who

are "normal" in their capacity to tune out strong associations and contextual cues, and the Medium and Low ADT Groups comprised of individuals who have, respectively, a mild or serious defect or impairment in this regard.

The ADT as a Measure of Attention Deficit

In order to examine the notion that poor ADT performance reflects a deficit in S.I.C. of attention, which in the normal population is otherwise intact, it is worthwhile to examine more carefully the demands of this test. Let us consider the following two test items (The correct response is underlined).

1. I rented a suite of rooms

   a. hotel b. pipe c. sweater d. sugar

2. He stood by the pit.

   a. split b. hole c. sat d. peach

One might speculate that poor performance on this test reflects one or more of the following factors:

1. A tendency to get "fixed" on the dominant word meaning (i.e. the meaning suggested by the contextual cues). If this occurs the alternate meaning will remain unavailable to the subject despite the associative priming which occurs when the correct associate is read by E. One might conceptualize this difficulty as an inability to "tune out" the dominant word meaning and contextual cues of the sentence.
2. An inability to resist responding with an associate to the dominant word meaning (e.g. choosing a on item 1)

3. An inability to resist responding with an associate to the contextual cues (choosing c in item 2; sat is an associate to stood).
4. An inability to resist responding with a clang associate of the multi-meaning word (choosing a in item 2).

The ADT Control Test suggests that were it not for misleading contextual cues and word associations, all subjects would recognize the correct associative pair for each item (i.e. sweet-sugar; pit-peach). Further, an analysis of the types of errors made on this test showed that no subjects erred by choosing an irrelevant item (e.g. choice b, for item 1) which was unrelated to the dominant word meaning or contextual cues. Rather, errors involved a choice of an associate to the dominant word meaning, or an associate to contextual cues in the sentence (A few Ss erred by choosing clang associates but this was exceptional). This further supports the notion that errors are due to an inability to inhibit responding to dominant and compelling associates or contextual cues.

The notion that poor ADT performers represent a defective group (rather than the lower end of the normal distribution curve) gains credence not only from the small number of low scorers in the present sample, but also from the fact that S.I.C. of associative behavior is a pre-requisite for basic ego functioning. Speaking to this point, Maher (1966) has suggested that the ability to "filter out" or inhibit responding to strong associations which enter into thought is essential for the maintenance of normal thought and language, and that the inability to do so reflects an

impairment of selective-inhibitory mechanisms which underlies much of schizophrenic pathology. It is relevant to briefly examine the literature regarding the problem of attention in schizophrenia, for it is not unlikely that poor ADT performance may reflect the same attention deficit that is described in this clinical literature.

The problem of attention in schizophrenia has been conceptualized as a breakdown of selective-inhibitory mechanisms (McGhie and Chapman, 1961) and is frequently discussed under the headings of "overly narrowed" or "overly broadened" attention. In regard to the former, schizophrenic patients often report getting "fixed" or "stuck" on a particular stimulus that they are unable to get past. The following patient reports are illustrative: (Silverman, 1969)

> If I am reading I may suddenly get bogged down at a word . . . When this happens I can't get past it. It's as if I am being hypnotized by it . . . It's not so much that I absorb it, it's more like it's absorbing me.
>
> . . . suddenly I get stuck. What happens is that I suddenly stick on a word or an idea in my head and I just can't move past it. It seems to fill my mind and there's no room for anything else.

Clearly, this type of attentional problem would result in poor ADT performance which demands that the individual resist getting "stuck" on the dominant word meaning suggested by the contextual cues or its associates.

The schizophrenia literature also describes a pathological "broadening" of attention, which leaves the individual feeling flooded by excessive stimulation which he is helpless to filter out (McGhie and Chapman, 1961; Venebles, 1964). Consider the following patient reports: (McGhie & Chapman, 1961)

> It's as if I am too wide awake -- very very alert . . . Everything seems to go through me. I just can't shut things out.
>
> My thoughts get all jumbled up. I start thinking or talking about something but I never get there. Instead I wander off in the wrong direction and get caught up with all sorts of different things that may be connected with things I want to say but in a way I can't explain.
>
> I just can't concentrate on anything. There's too much going on in my head and I can't sort it out. My thoughts wander round in circles without getting anywhere. I try to read even a paragraph in a book but it takes me ages because each bit I read starts me thinking in ten different directions again.

A breakdown in S.I.C. of attention which leaves the individual unable to tune out internal and external stimuli has been considered by many theorists to be the primary deficit in schizophrenia which is responsible for disordered thinking and language in the acute stage of the illness. Maher (1966) for example, has suggested that the inability of the schizophrenic individual to verbalize a logical sequence of ideas may stem from his difficulty in ignoring or filtering out strong associations which enter into thought. Maher quotes the following statement as illustrative.

> "I may be a 'Blue Baby' but 'Social' Baby not, but yet a blue heart baby could be in the Blue Book published before the war." (p. 413)

The interruption of a train of thought by irrelevant associations to the word blue is quite evident in the above sentence written by a schizophrenic patient. Maher's analyses of the sentence is as follows:

> We could hypothesize that the original thought was related to the fact that this patient had suffered from heart trouble. Thus, the first communication might have been intended as 'I was a blue baby'.

> This, in turn, may have prompted the association with 'blue blood' in the sense of social status, hence the interruption of 'Social Baby not.' This interplay between the two meanings of blue then appears as the next thought 'yet a blue heart baby could have been in the (society) Blue Book.'(p. 413)

It is likely that an attentional difficulty of this sort, where the individual is "captured" first by one association and then another, would result in poor ADT performance which requires considerable capacity for control, direction and inhibition of associative elements.

Although these two types of attentional difficulties (i.e. "narrowed" and "broadened" attention) have been considered by some to be contrasting attentional styles that are conceptually distinct (Venebles, 1964), clinical studies report a rapid alternation of the two styles within the same individual (Silverman, 1969). Further, both conditions can be understood as a deficit in "tuning out". In the first case (narrowed attention) the individual is unable to tune out a very compelling stimulus in order to allow a broader range of cues to enter consciousness. In the second case, the individual is unable to tune out a wealth of compelling but task irrelevant associations and thus feels in danger of being "swamped" or flooded. In both instances the loss of control and direction of attention is the critical factor. Patients feel they are not longer able to direct their attention volitionally, but rather their attention is "caught" or "captured" either by a particularly compelling stimulus, or by a multitude of stimuli. In either case, impaired S.I.C. of attention seems to be the critical factor involved,

and in either case, performance on a task such as the ADT would be dramatically disrupted.

Of relevance is a test designed by Chapman and his associates (1964) in which double meaning words were presented to schizophrenic subjects in sentences containing weak contextual cues. Each word was independently identified as having a strong and a weak meaning, when encountered without the context of other words (e.g. the word board has the strong meaning of 'flat piece of wood' and the weak meaning of 'food'). Test items were constructed as follows: When the farmer bought a herd of cattle he needed a new pen. This means:

A. He needed a new writing implement (strong but incorrect)
B. He needed a new fenced enclosure (strong and correct)
C. He needed a new pick-up truck (irrelevant error)

The professor loaned his pen to Barbara. This means:

A. He loaned her a pick-up truck (irrelevant error)
B. He loaned her a writing implement (strong and correct)
C. He loaned her a fenced enclosure (weak and incorrect)

Although each of the items in Chapman's test was constructed so that the sentence context was sufficiently clear to indicate the correct choice to normal subjects, it was found that schizophrenics produced strong meaning responses regardless of whether or not the context called for them. One way to interpret these results is in terms of a malfunction of some inhibitory mechanisms which makes the schizophrenic patient unable to inhibit the strong meaning of the word.

It is possible then, that individuals who do poorly on the ADT (which is conceptually similar to Chapman's test) are characterized by an impairment of S.I.C. of attention which is like

that described in the literature on schizophrenia. This is not to suggest that these persons are schizophrenic, but it is possible that conditions of sufficient stress might exacerbate their attentional difficulties and lead to more dramatic impairments in their capacity to control and direct their attention.

Of relevance is the fact that many errors made by schizophrenic subjects in laboratory situations are very similar to those made by normals under special conditions such as sensory deprivation, emotional excitement, relaxed attention and psychotomimentic drugs. There is also evidence that even under ordinary conditions schizophrenic responses often represent an accentuated expression of certain normal response biases. Supporting this point of view, Chapman (1964) writes, "It is as if the response biases (of normals) are released and expressed more freely." If it is true that there is a valid correspondence between normal and schizophrenic response tendencies, the ADT may prove to have valuable prognostic implications.

Associative Productivity: An Asset or Impairment?

As was noted earlier, Mednick considers the main operations underlying effective RAT performance (as well as creative ability) to be the number of associative elements available to an individual and the shape of the associative domain (with high RAT individuals having more associative elements of even response strength in their hierarchy). While high RAT scorers and creative individuals in general may meet this criteria, persons with an impairment of selective-inhibitory attention may also fulfill these requirements.

For example, Cramer (1968) reports that on word association tests schizophrenics tend to manifest greater associative breadth (because of an inability to restrict the associative domain) and a flatter response gradient (purportedly due to an increased strength of weak, tangential or remote associations). It may be helpful then, to distinguish between two types of associative productivity. It is this writer's hypothesis that associative productivity may result from good S.I.C. of attention which enables an individual to tune out overlearned associative elements to gain access to more remote ones. But greater associational breadth may also result from an attentional deficit resulting in a heightened susceptibility to associative interference. If we consider the early description of schizophrenic patients it is clear that such individuals may be aware of a "broad range of cues" and are "open" and sensitive to remote and peripheral associations. But this writer would question whether individuals who lack control, direction, and inhibition of attention deployment would have an advantage on Mednick's test. The low RAT scores of the poor ADT individuals would suggest that a difficulty in inhibiting responding to salient stimuli will not facilitate RAT performance. In other words, this writer suggests that "associative productivity" which is the result of an impaired capacity to tune out tangential associations, should be distinguished from a more controlled ability to gain access to remote associative elements.

The distinction between these two types of associative productivity is relevant not only to RAT performance but also to

creative ability, which the RAT purportedly measures. As noted earlier, creative ability has frequently been associated with psychopathology, and analogies have been made between high RAT scorers and schizophrenic individuals (Libby, 1970). Lombrose (1891) made the classical presentation of the viewpoint that the mental conditions which produce creative genius and insanity are related, if not identical. The idea that schizophrenic individuals are especially creative is similar to the viewpoint that psychomimetic drugs such as LSD greatly facilitate the creative process, for both LSD and acute schizophrenic states may involve a profound loss of control over selective-inhibitory aspects of attention.

This writer would question, however, whether the involuntary abandonment of conscious control can result in creative production. The link between madness (drug induced or otherwise) and creativity has been documented largely by anecdotal evidence and subjective reports, and more objective research often yields contrary findings (Hebeisen, 1960). The breakdown of S.I.C. of attention reported to occur in LSD users and acute schizophrenic patients may certainly result in novelty, and originality of thought and perception, as well as associative productivity, however, it is less certain whether the results are creative ones. On the one hand, it is true that these "altered states of consciousness" do disrupt the habitual sets of mind, and leave the individual sensitive to relationships between remote stimuli which would otherwise go unnoticed. But without some degree of control, direction, and inhibition, it seems unlikely, to this author's

thinking, that these attentional states will facilitate creative thinking. Kris's (1952) concept of "regression in the service of the ego" speaks to that part of the creative process which requires a return to more controlled activity which allows for testing, selecting, refining, and consolidating. The necessity for control of attention deployment in the creative process received some support from the present study which found that poor S.I.C. of attention (as measured by ADT performance) was related in males to very poor creativity ability (as measured by RAT scores). Obviously this "support" must be offered very tentatively, since the ADT is a new test with unknown validity, and the RAT, like all available creativity measures, has yielded inconsistant results in terms of its predictive success.

A final point which was mentioned earlier deserves to be reiterated.

In discussing the kind of attentional style which best facilitates creative production, there is a tendency for writers to speak in terms of dichotomies (e.g. loose, passive, automatic vs. controlled, focused, directed, attention). In so doing, what becomes obscured is the important notion that an individual may vary his attentional style in accordance with his own intentions and/or the task requirements and demands. It is important to recognize, then, that individuals who perform well on tasks requiring effortful, controlled, and intensely focused attention, may also be adept at assuming a passive, free-ranging and receptive attentional style. In fact it is not unlikely that good control over selective-inhibitory aspects of attention will only lead to

creative production when it is accompanied by the capacity to temporarily relinquish this control and adopt a more relaxed, flexible, receptive, cognitive attitude.

Hypothesis II: The Relationship Between RAT and SCDT Performance

The lack of a significant relationship between RAT and SCDT scores fails to support the second hypothesis that effective RAT performance is related to the capacity to resist interference from misleading task irrelevant cues, regardless of the non-verbal nature of the distracting stimuli. It is perhaps of some theoretical interest that a negative correlation was not obtained for it has been argued that high RAT scorers are generally more prone to confusion and interference, a notion which is not supported by the present findings.

The lack of any relationship between RAT and SCDT scores fails to replicate earlier findings by Gamble and Kellner (1968) who report a positive relationship between RAT performance, and performance on the Stroop Color Word Test. It is difficult to understand why these discrepant results occurred and further research would be necessary to clarify this issue.

The insignificant correlation between RAT and SCDT scores is also surprising in view of earlier studies by Klein (1954) involving the Stroop Test. Klein studied the trend of free associations for both thirsty and sated subjects who differed in Stroop performance. Subjects were instructed to give continual associations for three minutes to two stimulus words, house (a neutral stimulus) and dry (a drive related stimulus for thirsty ss).

Subjects were instructed that the stimulus word was meant only to "start them off" and not to limit them. Whereas poor Stroop individuals tended to cluster in a tightly contained orbit around the stimulus word, good Stroop performers gave many remote associations for both stimulus words. The tendency of good Stroop performers to give remote associations would suggest that this test (and similarly the SCDT) would be positively related to RAT performance which is facilitated by the production of remote associations. Further, Holt (1960) found that poor Stroop performers have difficulty using primary process thinking in effective ways, which might again suggest that these low Stroop individuals would do poorly on the RAT, if the RAT is indeed a test measuring creative potential.

It should be noted, however, that the failure to obtain a significant relationship between scores on the RAT and SCDT does not contradict the theory that selective inhibitory control of attention is related to RAT performance. The negative finding does suggest, however, that one cannot discuss the role of selective attention in regard to RAT performance, without more clearly specifying what is meant by "selective attention". While the present study lends some support to the notion that difficulty resisting distraction from contextual cues and dominant associations may for males result in poor RAT performance, it is clear that RAT performance is not related to the ability to resist distraction from the overlearned printed color word on the SCDT. It may be then, that because the RAT is purely associational

in nature, it does not correlate with skills on selective attention tasks where the distracting stimuli are non-associational in nature.

It is clear then, that for either sex RAT performance is not related to a general tendency to be "more or less interference prone". In fact, it may be misleading to think in terms of abilities or impairments in S.I.C. of attention, which are independent of specific modalities or task demands. This issue will be discussed further in regard to Hypothesis III.

Hypothesis III: The Relationship Between ADT and SCDT Performance

The third hypothesis suggested that there would be a positive relationship between two different measures of selective attention -- the SCDT and the ADT. The SCDT measures an individual's ability to inhibit responding to compelling perceptual cues, whereas the ADT purportedly taps the ability to inhibit responding to compelling word associations and contextual cues. To this author's thinking, the SCDT involves "tuning out" of cues which may be considered "external" or peripheral, whereas the ADT involves "tuning out" cues which are more "internal", central, or cognitive. There is no relationship between performance on these two tasks and the third hypothesis is not supported.

The fact that there is no relationship between performance ability on these two tasks has certain theoretical implications. Too frequently, researchers in the area of attention have relied on experimental tasks which tap the most peripheral aspects of attention deployment (e.g. looking behavior, listening behavior)

and have then proceeded to make inferences regarding the most central aspects of attention deployment (e.g. concerning memory, associative behavior, defense mechanisms). Silverman (1964), for example, has used data derived from laboratory studies of perceptual scanning in schizophrenic patients, and has then proceeded to infer a dynamic theory concerning the most central aspects of the patients' experience.

Psychoanalytically oriented researchers in the area of cognitive styles, have also assumed a consistancy of attention deployment over varied levels of psychological functioning and task demands (e.g. Gardner et al., 1959; Holzman and Gardner, 1959). Investigations of extensiveness and selectiveness of attention figure prominantly in this literature, and it is reported that individuals show a similar attentional style to external stimulation (i.e. perceptual tasks, such as size estimation, Stroop, Rod and Frame Test) and to internal processes (thoughts, memories, defenses, associative behavior). A careful reading of the cognitive style literature, however, suggests that this assumption is based more on faith than on careful experimentation. In fact, this writer would argue that these researchers have failed to design or utilize experimental tasks that can be said to measure stylistic modes of extensive or selective attention in regard to associative behavior.

In regard to S.I.C. of attention, many theorists have assumed that "impaired selective attention" is a generalized deficit which is not specific to a particular modality or task demand

(Venebles, 1964; Silverman, 1964). For example, in schizophrenia research, investigators have described a breakdown of a "filter mechanism" which results in the individual being "compelled to attend" to irrelevant stimuli that would otherwise be tuned out. This failure of inhibition of attention has been reported to occur in relation to thoughts and associations, visual stimuli, and auditory cues as well, and researchers have not assumed that there might be variations in functioning within a single individual (McGhie and Chapman, 1961; Silverman, 1969).

There is, however, a lack of experimental evidence demonstrating a pervasive consistancy regarding skills, or deficits, or styles in selective-inhibitory attentional mechanisms. Rather, it has been assumed, often implicitly, that the individual who is inadept at resisting distraction on a dichotic listening task (auditory mode) will tend to do equally poorly in resisting distraction on a visual task (e.g. the SCDT or Stroop Color Word Test) or on a task involving associative distraction (cognitive mode). The present study, however, which indicates that there is no relationship between performance on the ADT and SCDT, lends support to the notion that a particular individual may be characterized by impairment of selective attention in one area of functioning, and be skilled in another. An examination of test scores in the present study indicates that certain individuals who failed miserably in their ability to "tune out" compelling and distracting associations on the ADT, did unusually well on the SCDT, and had little difficulty tuning out the overlearned printed color word.

In sum then, it may be misleading to think of individuals as characterized by a general capacity (or debility) in resisting the effects of disrupting, interfering, or task irrelevant stimuli, without taking into consideration the nature of the interfering or disrupting cues. Clearly, in regard to S.I.C. of attention, further research is necessary to determine patterns of individual differences and consistencies over a wide range of tasks and varying modalities.

Again, it is important to keep in mind that the theoretical speculations based on findings utilizing the ADT are offered as tentative and in the spirit of exploration. The important question of whether the ADT measures what it purports to measure can be answered only by further research, and the present study leaves many questions unanswered regarding this new test. It is not clear, for example, whether the ADT is measuring an attribute of skill which is normally distributed in the population, or whether it is a measure of attention deficit, or impairment in selective-inhibitory mechanisms. More important, it has not been established that selective-inhibitory functions are the sole or even the major operation underlying effective ADT performance and the positive relationship between this test and vocabulary scores for males raises the question of whether other aspects of verbal ability may be involved. Then, there is the puzzling question of sex differences. Why should the ADT be related to vocabulary skills in males and not in females? The fact that so little is

known about the ADT makes the theoretical speculations in the present research very speculative indeed.

Although the exploratory nature of the present study precludes the possibility of obtaining conclusive and convincing theoretical findings, this writer would argue that the construction of the ADT is a beginning step in a critically important research area. Despite the fact that disturbance in S.I.C. of associative behavior has been recognized as an important clinical phenomenon, researchers have not concerned themselves with designing objective experimental tasks to assess an individual's functioning in this area. To this writer's thinking, a test which measures selective-inhibitory aspects of associative behavior is one of the most sorely needed tools, not only because of its potential relevance to schizophrenic pathology, but also because of its relevance to research regarding cognitive controls and attention deployment. As was mentioned earlier, experimental tasks which tap the most peripheral areas of psychological functioning (e.g. "looking" or "listening" behavior) may have limited relevance to more internal processes such as cognition, memory, or associative behavior. Designing a test which taps selective-inhibitory aspects of associative behavior is a sorely needed task, but it is also a very difficult one. The fact that no such test exists (which creates some problem in establishing concurrent validity for the ADT) speaks well to this difficulty. The construction of the ADT is a start in this direction.

APPENDIX A

Test Instructions for Associative Distraction Test

Many words in the English language have multiple meanings. The word plate, for example, means, a dish and it also means, the home base in baseball. The first meaning (a dish) occurs more easily to people because it is the more common meaning of the word. If you are not a sports fan you may have to struggle a bit to remember that plate also means the home base in baseball.

Every item in this test contains a sentence which includes a multimeaning word, as well as a number of related words. The context of the sentence will suggest to you which meaning of the word is intended. Consider the following item:

1. Pass me a fork and plate.

   a. spoon b. home run c. rate d. sweater

Now, in the above item, the sentence suggests the meaning, dish. It is unlikely (although possible) that someone would say, "Pass me a fork and home base". In this test, however, you must choose the word which is associated with the alternate meaning of the underlined word -- the meaning which is NOT suggested by the context of the sentence. In the above item the correct answer would be b (home run). The word home run is associated with the meaning of the word plate which is not suggested by the sentence.

Consider the following item:

2. They cheered as he reached the plate.

   a. saucer b. strike c. date d. forest

Here the correct answer is a (saucer). The sentence suggests the

meaning, baseball plate. Therefore you want to find the word which is related to an alternate meaning of the word plate. Choice a is correct because the word saucer is connected with a meaning of the word plate which is not suggested by the sentence.

Let's try a particularly difficult item:

3. Let's count them.

a. divide b. princess c. mount d. orange

In this item the correct answer is b. A meaning of the word count which is not suggested by the sentence is a European nobleman. The word princess is associated with this alternate meaning of the word.

Here are two more, just for practice.

4. He left a note on the table.

a. piano b. chair c. pencil d. letter

5. Let's flee from the scene of the crime.

a. fleece b. police c. bite d. stay

The correct answer to number 4 is a (note-piano). The correct answer to number 5 is c (flea-bite). In number 5 you may notice that the two meanings of the underlined word (flea-flee) are spelled differently. For certain items in this test, the alternate meaning may have a different spelling than the meaning suggested by the sentence.

In this test the examiner will read each item to you, and you will write down the letter of the correct answer (a,b,c,d) on your answer sheet. Listen carefully because no item will be repeated twice. If you miss an item, leave it blank.

Examiner's Copy of Associative Distraction Test

Sample Items

a. Fix the crack in the ceiling.

a. roof b. wiseguy c. smack d. large

b. The building is made of steel.

a. strong b. purse c. iron d. reel

c. I rented a suite of rooms.

a. hotel b. pipe c. sweater d. sugar

Test Items

1. This is a rare occasion.

a. jewel b. steak c. event d. stick

2. Leave a generous tip for the waitress.

a. large b. table c. advice d. sip

3. The precious diamond is missing!

a. ring b. gas c. flower d. spade

4. Play in the yard outside.

a. joy b. ball c. foot d. grass

5. We sailed at sea.

a. boat b. sick c. come d. look

6. Pass the board and hammer.

a. room b. nails c. handle d. hoard

7. Plant the corn in the fields.

a. foot b. cob c. grow d. window

8. He stood by the pit.

a. split b. hole c. sat d. peach

9. I counted <u>two</u> dogs.

a. three b. either c. also d. none

10. I threw a <u>rock</u> at the window.

a. basket b. cradle c. stone d. door

11. My boss gave me a <u>raise</u>.

a. pay b. sun c. work d. key

12. Grab the ball and <u>bat</u>.

a. wings b. paper c. battle d. base

13. Go on <u>deck</u>.

a. doll b. ship c. cards d. wreck

14. He was nervous about his first <u>date</u>.

a. kiss b. brave c. big d. fig

15. Quiet down that <u>racket</u>!

a. jacket b. business c. loud d. hair

16. The <u>bark</u> is peeling off.

a. skin b. banjo c. tree d. bite

17. Which <u>bank</u> is more reliable?

a. money b. spank c. river d. interest

18. Give me <u>one</u> potato.

a. prize b. count c. all d. two

19. She took quite a <u>fall</u>.

a. drop b. winter c. falsify d. down

20. I can <u>beat</u> you at tennis.

a. trophy b. loser c. carrot d. brother

21. What a <u>deal</u> I got on the car!

a. sale b. bus c. cards d. swindle

22. Put a log in the fire.

a. lodger b. fuel c. ice d. diary

23. Let's take a poll of opinions in this room.

a. pencil b. telephone c. elevator d. survey

24. You're on the border between passing and failing.

a. dirt b. rent c. edge d. order

25. What type of person are you?

a. style b. cloud c. write d. doctor

26. We travel in spring.

a. bounce b. summer c. rain d. airplane

27. Now you're really "up the creek".

a. swim b. queer c. pillow d. door

28. The ice pick is no longer sharp.

a. blind b. dull c. knife d. choose

29. Let's run quickly.

a. stem b. election c. slow d. walk

30. I saw a bear in the woods.

a. burden b. camp c. barely d. desk

31. Go through the park by this route.

a. dark b. girl c. ball d. with

32. The seal was clumsy on land.

a. ceiling b. grace c. stamp d. flippers

33. Be careful of the sharp point.

a. towel b. round c. aim d. knife

34. Go to the top of the hill.

a. bottom b. mountain c. lake d. spin

35. Use a nail and bolt.

a. perfume b. run c. hammer d. colt

36. Will you join my club?

a. stick b. meet c. sorority d. clock

37. I locked the box.

a. key b. pen c. fists d. lid

38. The fire was hot.

a. job b. cold c. liar d. burn

39. Go blow your horn.

a. trumpet b. table c. quiet d. deer

40. How much grain does the farmer have?

a. wood b. seed c. granite d. city

Subject's Answer Sheet for the Associative Distraction Test

Name _____ Sex _____ Native Language _____

Telephone _____ Are you color blind? _____

Sample Items

_____ a.	a. roof	b. wiseguy	c. smack	d. large
_____ b.	a. strong	b. purse	c. iron	d. reel
_____ c.	a. hotel	b. pipe	c. sweater	d. sugar

Test Items

_____ 1.	a. jewel	b. steak	c. event	d. stick
_____ 2.	a. large	b. table	c. advice	d. sip
_____ 3.	a. ring	b. gas	c. flower	d. spade
_____ 4.	a. joy	b. ball	c. foot	d. grass
_____ 5.	a. boat	b. sick	c. come	d. look
_____ 6.	a. room	b. nails	c. handle	d. hoard
_____ 7.	a. foot	b. cob	c. grow	d. window
_____ 8.	a. split	b. hole	c. sat	d. peach
_____ 9.	a. three	b. either	c. also	d. none
_____10.	a. basket	b. cradle	c. stone	d. door
_____11.	a. pay	b. sun	c. work	d. key
_____12.	a. wings	b. paper	c. battle	d. base
_____13.	a. doll	b. ship	c. cards	d. wreck
_____14.	a. kiss	b. brave	c. big	d. fig
_____15.	a. jacket	b. business	c. loud	d. hair
_____16.	a. skin	b. banjo	c. tree	d. bite

_____17.	a. money	b. spank	c. river	d. interest
_____18.	a. prize	b. count	c. all	d. two
_____19.	a. drop	b. winter	c. falsify	d. down
_____20.	a. trophy	b. loser	c. carrot	d. brother
_____21.	a. sale	b. bus	c. cards	d. swindle
_____22.	a. lodger	b. fuel	c. ice	d. diary
_____23.	a. pencil	b. telephone	c. elevator	d. survey
_____24.	a. dirt	b. rent	c. edge	d. order
_____25.	a. style	b. cloud	c. write	d. doctor
_____26.	a. bounce	b. summer	c. rain	d. airplane
_____27.	a. swim	b. queer	c. pillow	d. door
_____28.	a. blind	b. dull	c. knife	d. choose
_____29.	a. stem	b. election	c. slow	d. walk
_____30.	a. burden	b. camp	c. barely	d. desk
_____31.	a. dark	b. girl	c. ball	d. with
_____32.	a. ceiling	b. grace	c. stamp	d. flippers
_____33.	a. towel	b. round	c. aim	d. knife
_____34.	a. bottom	b. mountain	c. lake	d. spin
_____35.	a. perfume	b. run	c. hammer	d. colt
_____36.	a. stick	b. meet	c. sorority	d. clock
_____37.	a. key	b. pen	c. fists	d. lid
_____38.	a. job	b. cold	c. liar	d. burn
_____39.	a. trumpet	b. table	c. quiet	d. deer
_____40.	a. wood	b. seed	c. granite	d. city

Answer Key to Associative Distraction Test

1.	b	21.	c
2.	c	22.	d
3.	d	23.	b
4.	c	24.	b
5.	d	25.	c
6.	a	26.	a
7.	a	27.	d
8.	d	28.	d
9.	c	29.	b
10.	b	30.	a
11.	b	31.	c
12.	a	32.	c
13.	c	33.	c
14.	d	34.	d
15.	b	35.	b
16.	d	36.	a
17.	c	37.	c
18.	a	38.	a
19.	b	39.	d
20.	c	40.	a

APPENDIX B

Examiner's Copy of Associative Distraction Test (Control)

Sample Items

a. I've heard that crack before.

a. pen b. wiseguy c. comb d. paper

b. Don't steal the banana.

a. purse b. join c. map d. eat

Test Items

1. I prefer it rare.

a. mouse b. steak c. yellow d. grass

2. Take a tip from me.

a. jewel b. event c. advice d. stick

3. I don't have a single diamond in this hand.

a. boat b. joy c. book d. spade

4. It's about one yard.

a. table b. sick c. foot d. sip

5. Can you see now?

a. turn b. begin c. loser d. look

6. Is board included?

a. room b. battle c. time d. doll

7. I'm bothered by this corn I've developed.

a. foot b. ship c. window d. daughter

8. Don't swallow the pit.

a. wreck b. nails c. pencil d. peach

9. 'Me too!' he cried.

a. pay b. work c. also d. key

10. Don't rock!

a. cob b. cradle c. blue d. hoard

11. Look at the rays!

a. either b. sun c. paper d. door

12. She feared seeing a bat.

a. wings b. group c. money d. hole

13. Is this deck complete?

a. sat b. plane c. cards d. stone

14. Would you care for another date?

a. microphone b. big c. trophy d. fig

15. What a racket!

a. dog b. business c. flower d. drop

16. That's a loud bark.

a. interest b. swindle c. bus d. bite

17. The scouts reached the bank.

a. ball b. sale c. river d. basket

18. I won!

a. prize b. jacket c. loud d. hair

19. Are you coming in the fall?

a. room b. winter c. two d. spank

20. This beet looks terrible!

a. falsify b. clip c. carrot d. banjo

21. You deal!

a. brave b. skin c. cards d. hammer

22. Who of us will keep a log?

a. cat b. blind c. doctor d. diary

23. Climb the pole.

a. dirt b. telephone c. coffee d. cloud

24. You're lucky to have such a reliable border.

a. lion b. rent c. fuel d. walk

25. I can hear him type.

a. skip b. edge c. write d. today

26. This had no spring to it!

a. bounce b. lodger c. survey d. pencil

27. Do you hear it creak?

a. jest b. style c. theory d. door

28. Can I pick it out?

a. slow b. elevator c. pillow d. choose

29. Who from this group will run next year?

a. dull b. election c. airplane d. rain

30. How much can I bear?

a. burden b. key c. pen d. imagine

31. Who threw it?

a. sorority b. clock c. ball d. seed

32. Can you seal this?

a. trumpet b. bottom c. stamp d. grace

33. Point it elsewhere.

a. flippers b. colt c. aim d. barely

34. The child is playing with a top.

a. dark b. knife c. with d. spin

35. See him bolt!

a. round b. run c. quiet d. grow

36. Don't club me!

a. stick b. ceiling c. girl d. ice

37. I don't like to watch people box.

a. dull b. lake c. fists d. tree

38. Don't fire me, please!

a. job b. granite c. city d. table

39. It has neither gills nor a horn.

a. camp b. burn c. liar d. deer

40. The grain added to its beauty.

a. wood b. cold c. swim d. perfume

Subject's Answer Sheet for the Associative Distraction Test (Control)

Sample Items

_____ a.	a. pen	b. wiseguy	c. comb	d. paper
_____ b.	a. purse	b. join	c. map	d. eat

Test Items

_____ 1.	a. mouse	b. steak	c. yellow	d. grass
_____ 2.	a. jewel	b. event	c. advice	d. stick
_____ 3.	a. boat	b. joy	c. book	d. spade
_____ 4.	a. table	b. sick	c. foot	d. sip
_____ 5.	a. turn	b. begin	c. lower	d. look
_____ 6.	a. room	b. battle	c. time	d. doll
_____ 7.	a. foot	b. ship	c. window	d. daughter
_____ 8.	a. wreck	b. nails	c. pencil	d. peach
_____ 9.	a. pay	b. work	c. also	d. key
_____ 10.	a. cob	b. cradle	c. blue	d. hoard
_____ 11.	a. either	b. sun	c. paper	d. door
_____ 12.	a. wings	b. group	c. money	d. hole
_____ 13.	a. sat	b. plane	c. cards	d. stone
_____ 14.	a. microphone	b. big	c. trophy	d. fig
_____ 15.	a. dog	b. business	c. flower	d. drop
_____ 16.	a. interest	b. swindle	c. bus	d. bite
_____ 17.	a. ball	b. sale	c. river	d. basket
_____ 18.	a. prize	b. jacket	c. loud	d. hair
_____ 19.	a. room	b. winter	c. two	d. spank
_____ 20.	a. falsify	b. clip	c. carrot	d. banjo

_____21.	a. brave	b. skin	c. cards	d. hammer
_____22.	a. cat	b. blind	c. doctor	d. diary
_____23.	a. dirt	b. telephone	c. coffee	d. cloud
_____24.	a. lion	b. rent	c. fuel	d. walk
_____25.	a. skip	b. edge	c. write	d. today
_____26.	a. bounce	b. lodger	c. survey	d. pencil
_____27.	a. jest	b. style	c. theory	d. door
_____28.	a. slow	b. elevator	c. pillow	d. choose
_____29.	a. dull	b. election	c. airplane	d. rain
_____30.	a. burden	b. key	c. pen	d. imagine
_____31.	a. sorority	b. clock	c. ball	d. seed
_____32.	a. trumpet	b. bottom	c. stamp	d. grace
_____33.	a. flippers	b. colt	c. aim	d. barely
_____34.	a. dark	b. knife	c. with	d. spin
_____35.	a. round	b. run	c. quiet	d. grow
_____36.	a. stick	b. ceiling	c. girl	d. ice
_____37.	a. dull	b. lake	c. fists	d. tree
_____38.	a. job	b. granite	c. city	d. table
_____39.	a. camp	b. burn	c. liar	d. deer
_____40.	a. wood	b. cold	c. swim	d. perfume

APPENDIX C

Vocabulary Test

1. Breakfast

2. Slice

3. Fabric

4. Regulate

5. Enormous

6. Conceal

7. Hasten

8. Designate

9. Commence

10. Obstruct

11. Ponder

12. Calamity

13. Tangible

14. Fortitude

15. Audacious

16. Edifice

17. Ominous

18. Tirade

19. Impale

20. Travesty

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