8-2002

Cognitive Disinhibition and Creativity

Oshin Vartanian

COGNITIVE DISINHIBITION AND CREATIVITY

By

Oshin Vartanian

B.Sc. University of British Columbia, BC, 1995

A THESIS

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

(in Psychology)

The Graduate School

The University of Maine

August, 2002

Advisory Committee:

Colin Martindale, Professor of Psychology, Advisor

Roger Frey, Associate Professor Emeritus of Psychology

Marie Hayes, Associate Professor of Psychology

Alan M. Rosenwasser, Professor of Psychology

Larry Smith, Professor of Psychology

LIBRARY RIGHTS STATEMENT

COGNITIVE DISINHIBITION AND CREATIVITY

By Oshin Vartanian

Thesis Advisor: Dr. Colin Martindale

An Abstract of the Thesis Presented
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Philosophy
(in Psychology)
August, 2002

Eysenck (1995) and Martindale (1999) have proposed that creativity is characterized by cognitive disinhibition. Cognitive disinhibition is hypothesized to underlie many of the cognitive processes that have been associated with creative cognition, such as defocused attention and wide associative horizon. Whereas Eysenck (1995) argued that lower cognitive inhibition is a relatively permanent characteristic of the thinking style of creative people, Martindale (1999) has argued that creative people can focus or defocus attention depending on task demands. This dissertation describes four experiments that were designed to test the disinhibition theory in general, and specific predictions derived from Eysenck's and Martindale's versions of the theory in particular.

In the first experiment, participants were presented with pairs of stimuli and instructed to determine whether the two stimuli were related. Participants who scored higher on the Remote Associates Test were faster in this task compared to those who scored lower. This result supported Eysenck's (1995) and Martindale's (1999) theories,

suggesting that in creative people priming a concept is likely to activate representations of that concept more quickly than it would in noncreative people.

The second experiment involved an investigation of the relationship between creativity and performance on a proactive inhibition task. The proactive inhibition task involves memory performance on five successive trials. Participants with higher scores on the Creative Personality Scale performed worse on the third trial than those with lower scores. This finding did not support the disinhibition theory.

The third experiment was an investigation of the relationship between creativity and performance on a dichotic listening task. The results demonstrated that participants with higher scores on the Creative Personality Scale had better memory for words that were presented to the shadowed ear. Participants with higher scores on the Remote Associates Test had better memory for high-association words in the unattended ear. These results suggest that creative people can focus attention successfully, unless conditions facilitate a switching to a defocused mode.

The fourth experiment involved the identification of colors that varied in terms of ambiguity. Creative participants were faster in identifying colors regardless of ambiguity. The addition of a concurrent task to the color identification task had a more detrimental effect on the performance of noncreative females than it did on the performance of creative females. The results suggest that in this experiment, ambiguity was conceptualized differently than it was by Kwiatkowski, Vartanian, and Martindale (1999), who found that creative participants were slower in a task that involved ambiguity.

ACKNOWLEDGEMENTS

As legend has it, I decided to attend graduate school in Maine after reading a chapter by Colin Martindale in *Dimensions of Creativity*, a gift from my then future wife Daria. Soon afterwards, I read almost everything else by Colin that I could get my hands on, and then had the courage to send that first email. His brilliance has been a constant source of inspiration throughout my tenure in Maine, and I consider him to be one of my closest friends. Colin, being an honorary Armenian, knows what that means.

When I first arrived in Maine in 1997, Jonna Kwiatkowski was instrumental in making me feel at home, and functioned as my tour guide on the early visit to the Martindale Amusement Park. I thank you for the wonderful friendship and all the support over the years, and look forward to our continued collaboration.

The Department of Psychology has afforded me the opportunity to meet many wonderful people, but there are a few whom I am particularly happy to have met. Thank you Larry for all the enlightening conversations, and for the wonderful classes that I looked forward to going to. To Marie and Alan for having been such good friends, for intellectually stimulating me, and for helping me when my spirits were down. To Roger Frey, otherwise known to my mother as the "Thanksgiving man," thank you for providing me with the extended family that I never had in Maine. I would also like to thank Dr. Joel Gold and Dr. Rick Ryckman for their continued support and wisdom. Many thanks also to Kathy McAuliffe and Shelley Rollins who have always been so wonderful to me.

I would also like to thank my friends Greg Young, Rob Morgan, Virginia Cylke, Kevin Mailepors, Zornitsa Keremidchieva, Tim Vedan, and Kama Truch, whom I consider friends for life. You had an important part to play in this too. Many thanks also To Jessica Matthews for a wonderful friendship, and our great collaboration on all things related to mental abilities!

I owe everything to my family, who have always loved and supported me throughout my life, and to whom I will forever be grateful. Of course the person who has been my biggest supporter over the years, and without whom none of this would have been possible, is my wonderful wife Daria. She accompanied me to Maine at a time when I needed it most, and I feel that having survived the tribulations of graduate school has brought us closer than ever before. You can count on my complete support should you decide to follow the same path. I thank my father, Albert, for not wavering to tell me the truth, my mother, Knarik, for whom I would do anything, my sisters Armineh and Alenoosh who inspire me every day, and my dear brother-in-law Raffy Demirdjian.

I dedicate this work to the memory of my beloved late aunt, Hajkoesch Shahbandarian.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Introduction

Creativity is commonly defined as the novel and useful combination of mental elements previously thought to be unrelated (see Sternberg, 1999). This definition has its roots in associationistic psychology, where the emphasis is not on the creation, but rather on the recombination of existing elements into novel products (Eysenck, 1995; Martindale, 1995). In general, researchers agree that there is no single causal mechanism that underlies individual differences in creativity. Instead, creativity is believed to be the product of the interaction among several cognitive, personality, and situational factors. For example, creativity has been shown to be correlated with intelligence (Sternberg & O'Hara, 1999), intrinsic motivation (Amabile, 1983), and a willingness to question convention (Feist, 1998, 1999). In this dissertation the emphasis will be on clarifying the *cognitive* processes that are associated with creative thinking, in particular those processes whereby seemingly unrelated mental elements are brought together.

The Neural-network Approach to Cognition

Before one can begin to discuss the ways in which certain mental processes may be involved in creativity, one needs to begin with a model of cognition. In this dissertation, the neural-network model of cognition will be used to understand mental processes. In its most basic form, the neural network model makes three assumptions to represent the mind: First, the mind is viewed as a network of cognitive units or *nodes* (Rumelhart, Hinton, & McClelland, 1986). Nodes are meant to represent neurons, but they are not assumed to be as complicated. What a node does is to assume a certain level of activation. Second, patterns of connections are hypothesized to exist among nodes. This allows activation or inhibition to travel from one node to another. Third, nodes are organized into structures. Fodor (1983) and Martindale (1991) have argued that nodes are organized into *modules*. Nodes within a module are devoted to a specific process. For example, nodes within the perceptual module are involved in the processing of perceptual information. In addition, it is assumed that nodes within modules are organized into layers. Generally, connections among nodes within the same level are assumed to be inhibitory, whereas connections between levels are assumed to be excitatory (Konorski, 1967; Martindale, 1991).

Creativity and Cognitive Inhibition

The cognitive process that is of central interest to this project is *cognitive disinhibition*. Eysenck (1993, 1995) and Martindale (1999) have argued that what differentiates creative from noncreative people is that the former have lower levels of cognitive inhibition in their cognitive (neural) networks. Normally speaking, cortical inhibitory mechanisms serve to limit the spread of activation among mental representations (Dempster, 1991; Martindale, 1991). Inhibition is important because it ensures that mechanisms that are irrelevant to the processing of information at any given point in time do not become activated. Lower cognitive inhibition makes it more likely that cortical activation can spread throughout the neural network, and that two previously unrelated mental elements will combine to form a novel product (Martindale, 1995). In fact, Eysenck (1995) and Martindale (1989) have argued that descriptions that have been used to characterize the cognitive processes of creative people, such as overinclusive thinking, defocused attention, and wide associative horizon (Mendelssohn, 1976; Mednick, 1962), are manifestations of cognitive disinhibition.

Cognitive Disinhibition and Psychoticism

How does one measure cognitive inhibition? Eysenck (1993) proposed that one can measure cognitive inhibition indirectly by measuring Psychoticism. Briefly, Eysenck developed a personality system based on three dimensions: Extraversion, Neuroticism, and Psychoticism (Eysenck & Eysenck, 1994). High scorers on Psychoticism are characterized as aggressive, cold, egocentric, impersonal, impulsive, antisocial, unempathic, creative, and tough-minded. Eysenck argued that an intermediate score on Psychoticism denotes the highest potential for the exhibition of creative behavior. High scores on Psychoticism predispose the person to developing a psychopathology (Eysenck, 1995). The hypothesized relationship between creativity and Psychoticism rests on the assumption that Psychoticism is a measure of cognitive disinhibiton. Thus, one would expect to observe a relationship between Psychoticism and creativity to the extent that both phenomena are manifestations of cognitive disinhibition.

Eysenck's hypothesis linking creativity to Psychoticism rests on two bodies of evidence: The genetic link between psychopathology (particularly schizophrenia and bipolar disorders) and creativity, and the role of inhibition in cognition. With respect to the former, several lines of evidence support Eysenck's contention that there may be a genetic link between creativity and psychopathology. For example, creative individuals are overrepresented in the family trees of schizophrenics (Heston, 1966; Karlsson, 1968, 1970). Also, creative people have been shown to have much higher scores on MMPI indices of psychopathology (Barron, 1969). Andreasen (1987) investigated the rates of mental illness in a group of creative writers, and found substantially higher rates of affective disorders, particularly of the bipolar type, among them. According to Eysenck, creative people, as well as those who suffer from schizophrenia and manic-depressive illnesses, are characterized by high dopamine and low serotonin levels in their hippocampal formation. Because dopamine and serotonin levels are genetically regulated, this implies that creative people and those who suffer from psychopathologies have genetic similarities. According to Eysenck, in both populations this similarity is manifested by lower levels of cognitive inhibition, which means that both populations are less capable of blocking out (i.e., inhibiting) irrelevant information from the focus of cognition (i.e., attention). In manic-depressive and schizophrenic people this leads to an inability to disengage from task-irrelevant concepts, and leads to disorganized thinking. In creative people this leads to the ability to synthesize seemingly unrelated concepts into novel products. Cognitive disinhibition leads to positive outcomes in creative people, because they possess additional attributes such as ego strength and the ability to focus on task demands, that allow them to maintain an organized cognitive scheme (Eysenck, 1995).

The second part of Eysenck's hypothesis rests on the performance of schizophrenic people on tasks that involve inhibitory cognitive processes. Eysenck (1995) predicted that-like schizophrenics and people who score high on Psychoticism-more creative people should perform better on latent inhibition and negative priming tasks (Beech & Claridge, 1987; Beech, Powell, McWilliam, & Claridge, 1989; Claridge, Clarke, & Beech, 1992). In latent inhibition tasks, an irrelevant stimulus in the first part of an experiment becomes relevant in the second part of the experiment. In negative priming tasks, people are told to ignore a supposedly irrelevant prime that turns out to be relevant on the next trial. In general, people tend to do poorly on these tasks because they filter out seemingly irrelevant stimuli. People with high scores on Psychoticism do well on these tasks precisely because they fail to filter out stimuli that are considered to be irrelevant. Using a variant of the Stroop task, Kwiatkowski, Vartanian, and Martindale (1999) tested Eysenck's theory by investigating the correlation between psychoticism and reaction time on a negative priming task: no relationship was found. The lack of a relationship between Psychoticism and reaction time indicated that the relationship between creativity and inhibition may not be mediated by Psychoticism. Kwiatkowski, Vartanian, and Martindale (1999) also investigated the relationship among Psychoticism, creativity, and performance on a latent inhibition task. Contrary to Eysenck's prediction, it was found that creative participants performed worse than noncreative participants. The combined results from the negative priming and latent inhibition experiments indicated that cognitive disinhibition may not be a general characteristic of creative people. However, it is also possible that reliance on an undergraduate population may have limited the range of creativity scores that may have been obtained using a more heterogeneous sample.

Eysenck's (1993) hypothesis has been criticized on conceptual grounds, partly for associating creativity with psychopathology (Sternberg & Lubart, 1993), and partly for suggesting that creativity can not be fostered (Torrance, 1993). In addition, there is no unanimous agreement on the questionnaire measurement of Psychoticism in healthy participants (Claridge, 1993). Nevertheless, to the extent that cognitive disinhibition is associated with creativity and Psychoticism, one should expect to discover an association between the latter two constructs. Significant associations between Psychoticism and creativity have been reported in a number of samples, such as university professors

(Rushton, 1990), German artists, writers, and actors (Götz & Götz, 1979a, 1979b; Merten & Fischer, 1999), and professional musicians working in the field of popular music in the United Kingdom (Wink, 1984). However, the direction of the correlation between creativity and Psychoticism in undergraduates has varied among studies (Kwiatkowski, Vartanian, & Martindale, 1999; Martindale & Dailey, 1996; Poroshina, Dorfman, & Vartanian, 2001; Vartanian & Martindale, 2001).

This state of affairs may in part be explained by the distinction between creative potential and creative output. Eysenck (1993) has argued that creative potential is a normally distributed trait that can be measured based on scores on Psychoticism: Generally, higher scores indicate a higher potential for the exhibition of creative behavior. However, scores above the intermediate range increase the vulnerability of the person to the development of psychopathology. The manifestation of creative output depends on the presence of additional factors, such as motivation, intelligence, and ego strength (Martindale, 1989). Generally, it has been easier to demonstrate a relationship between Psychoticism and creativity when the latter was measured based on creative output in real-life creative people (see Feist 1998, 1999). Thus, Psychoticism may not be a measure of cognitive disinhibition per se, but rather a measure of those attributes that are related to real-life creativity, such as tough-mindedness.

Martindale's Theory

Martindale (1995, 1999) has argued that as opposed to being in a permanent state of defocused attention, creative people are characterized by a tendency to oscillate back and forth along the primary process-secondary process continuum. Borrowing from Kris (1952), primary process cognition is characterized by analogical, free-associative, and irrational thinking. This pole of the continuum is accompanied by defocused attention and low cortical arousal. The creative insight is hypothesized to occur toward this pole of the continuum. Secondary process cognition is characterized by logical, abstract, and reality-oriented thinking. This pole of the continuum is accompanied by focused attention and higher levels of cortical arousal. The verification of a creative idea is hypothesized to occur in this state. Martindale has explained creativity in terms of the variability in the focus of attention and type of thought. This variability is in turn attributed to the variability in the general level of cortical activation.

Martindale's (1999) theory indicates that creative people tend to defocus attention when necessary, as on tasks calling for creative responses; however, they are also capable of focusing their attention on tasks that require focused attention, such as intelligence tests (Martindale & Hines, 1975). For example, creative participants had faster reaction times on an unambiguous Concept Verification Test, but slower reaction times on an ambiguous Stroop color-naming task (Kwiatkowski, Vartanian, & Martindale, 1999). The dependent variable in the Concept Verification Test is reaction time in understanding relatively unambiguous rules. The dependent variable in the Stroop color-naming task is reaction time in making color judgments in the presence of conflicting verbal cues. Thus, Kwiatkowski, Vartanian, and Martindale (1999) concluded that creative people are faster in processing unambiguous information, but slower in processing information that entails conflict or ambiguity. In addition, data on Navon's (1977) global-local task do not support the contention that creativity is associated with indiscriminate reduced cognitive inhibition. On this task, people are asked to name, for example, an H made up of small H's or S's. In general, the small letters that make up the large letter have no effect on the reaction time associated with naming the large letter. But if subjects are asked to name the small letters, reaction time is slowed if the small letters conflict with the large letter. It was found that creativity was associated with slower reaction time in both conditions. This suggests that creative people demonstrate slower reaction times when a task entails a potential for conflict or ambiguity, and faster reaction times when it does not (Kwiatkowski, Vartanian, & Martindale, 1999).

Creativity and Selective Attention

Eysenck (1995) and Martindale (1999) have argued that individual differences in creativity are a function of cognitive inhibition. Although cognitive inhibition cannot be measured directly using behavioral tasks, the central claim made in this dissertation is that it can be measured indirectly through tasks that involve selective attention. The idea that creativity and attention may be related is not new. Creativity is commonly defined as the novel and useful combination of previously unrelated mental elements (see Sternberg, 1999). As the following passage illustrates, one would expect this combinatorial process to occur within the spotlight of attention:

> The ability to maintain several streams of cognitive ability simultaneously, i.e., in parallel, increases the likelihood that otherwise separate sequences of thought will be brought into contiguity and combined. I assume that relationships between such sequences of thought can be better formulated or detected when they can be attended to and manipulated simultaneously. Consequently, the greater the internal attentional capacity, the more likely is the combinational leap which is the hallmark of creative thinking. (Mendelsohn, 1976, p. 363)

Martindale (1991, 1995) has argued that defocused attention can be understood in terms of lower cognitive inhibition. As inhibition decreases, it is more likely that a higher number of nodes in the cognitive network enter the focus of attention. This characteristic can be used to differentiate between more and less creative individuals. When not given any specific instruction to focus attention, one would expect creative people to process more peripheral information than would be expected from noncreative people. However, Martindale (1999) has argued that creative people can focus their attention when task demands require it. The next section will involve a discussion of three experimental paradigms that have been used to investigate selective attention, and how each paradigm has been modified for studying creativity in this dissertation.

Dichotic Listening Task

Ever since its introduction in the 1950s, the dichotic listening task has been one of the most popular techniques for studying selective attention in the auditory domain (Pashler, 1998). In this task, participants are presented with a different auditory message to each ear, and instructed to attend to one of the messages by "shadowing" (repeating) its contents as accurately as possible. Two consistent sets of findings have typified the results of this literature. First, memory for words in the attended message is affected by the physical characteristics of the signal, such as volume. Second, participants' memory for the contents of the unattended message is very poor. For example, repeating a word as many as 35 times in the unattended message may not cause any improvement in memory for that word (Payne & Wenger, 1998).

Despite the fact that researchers who study creativity have been interested in the role of attention in general and selective attention in particular, the use of the dichotic listening task to investigate individual differences related to creativity has been rare. In fact, only two studies have attempted to relate performance on this task to creativity. Dykes and McGhie (1976) investigated the performance of creative, noncreative, and schizophrenic participants on the dichotic listening task. The authors argued that one of the similarities between psychotic and creative cognition may be due to a wider and less selective processing of environmental stimuli by both populations. The hypothesis that schizophrenia is a syndrome that is at least partially due to a reduced ability to filter out irrelevant information was especially popular in the 1950s and 1960s (Rawlings, 1985; see also Eysenck, 1995). Dykes and McGhie (1976) argued that what differentiates creative from psychotic people is the ability of the former group to process the increased influx of information.

Dykes and McGhie used two different conditions of the dichotic listening task in their experiment: The word list condition and the prose condition. The stimuli in the word list condition consisted of six pairs of words that varied systematically in their degree of association. The words within three of the pairs had a high association with each other, and the words within the other three pairs had a low association with each other. Those six pairs of words were repeated ten times during the course of the experiment, such that one word within each pair was presented to one of the ears on each presentation. This resulted in the presentation of 60 words to each ear in the course of the experiment. For the prose condition, Dykes and McGhie (1976) constructed two passages of prose. Similar to the word list condition, they used six pairs of words that varied systematically in their degree of association. The words within three of the pairs had a high association with each other, whereas the words within the other three pairs had a low association with each other. The authors embedded the six pairs of words in the prose passages, such that each word pair was presented three times during the course of the experiment. Dykes and McGhie (1976) instructed their subjects to attend to the contents of one channel only, and to ignore the contents of the other channel. They were interested in determining whether the three groups would differ in their tendency to switch attention to the irrelevant channel. Such switching would be measured by memory for words that were presented to the unattended channel.

The results showed that participants were more likely to switch attention to the irrelevant channel in the word list condition. Presumably, attending to a meaningful passage constrains one's ability to switch back and forth between the relevant and irrelevant channels. As expected, compared to creative and noncreative participants, schizophrenic participants were more likely to switch to the irrelevant channel in both tasks. In addition, compared to noncreative participants, creative participants were more likely to switch to the irrelevant message if the material involved high association pairs in the word list condition. Thus, the performance of creative and noncreative participants was distinguishable only under the condition that encouraged maximal switching.

Rawlings (1985) investigated the relationship among Psychoticism, creativity, and performance under two different conditions of the dichotic listening task. In the "focused attention" condition, participants were instructed to attend to the message in one ear while ignoring the message presented to the unattended ear. This resembled the design used by Dykes and McGhie (1976). In the "divided attention" condition, participants were instructed to attend to the message in one ear while attempting to remember the contents of the message presented to the unattended ear. The stimuli in both cases consisted of eight pairs of words that were repeated randomly eight times. On each presentation, one of the words within each pair was presented to one of the channels. The association level of the word pairs was varied systematically, such that half consisted of high-association pairs, and the other half consisted of low-association pairs. At the end of each task participants were given a recognition test which consisted of the words from the shadowed and unshadowed channels and control words. The dependent variable of interest was the number of "intrusions" as measured by the number of words that were recognized from the unshadowed ear.

In the focused attention condition, creative participants made fewer intrusion errors than did noncreative participants. This result contradicted the findings of Dykes and McGhie (1976). In the divided attention condition, creative participants made significantly more intrusions than did noncreative participants. Rawlings' (1985) results indicated that creative participants were more likely to switch to the irrelevant channel if they were given specific instructions to attempt to remember the content of that message. When they were given instructions to ignore the contents of the irrelevant channel, they did so successfully, making fewer intrusion errors compared to noncreative participants.

Rawlings (1985) noted that one possible reason for the discrepancy between his findings and those reported by Dykes and McGhie (1976) is that although the participants in the latter study were instructed to engage in "focused attention" in both conditions, having been tested for memory for words in the unshadowed channel at the end of the first task could have made some participants switch to a "divided attention" mode when they were engaged in the second task. If so, the observation that they had better memory for words in the unshadowed ear in a focused attention condition would have been due to a switch to a divided attention mode, thus making the results from the two studies consistent.

Rawlings (1985) made a distinction between focused and divided attention conditions. If one were interested in determining whether creative people are less likely to filter out irrelevant information, the divided attention condition does not appear to be the best method to use, because participants are instructed explicitly to attend to the "irrelevant" channel. In addition, Rawlings (1985) and Dykes and McGhie (1976) used word lists that consisted of repetitions of word pairs. Although the authors did not state their reasons for using repetitions of word pairs as opposed to using nonrepeated words for each pair, one can presume that it was done to aid memory performance at time of recognition.

The combined results of the experiments by Rawlings (1985) and Dykes and McGhie (1976) suggest that creative people do not sample environmental stimuli in an indiscriminate way. On the contrary, they seem to attend to seemingly irrelevant stimuli when situational conditions are conducive for doing so. Eysenck (1995) argued that in general, creative people are more likely to attend to seemingly irrelevant environmental stimuli. On the other hand, Martindale (1999) has argued that creative people are characterized by their ability to vary their focus of attention, focusing and defocusing attention in response to situational cues. Thus, under the focused attention condition of the dichotic listening task, the two theories would predict different outcomes. Eysenck's (1995) theory would predict that despite instruction to focus on one message only, creative participants would switch to and thereby recall more words from the unshadowed channel. Martindale's (1999) theory would predict that given the cue to focus attention, creative participants would focus on the shadowed channel and recall more words from it. In this dissertation, the dichotic listening task was included to test the above hypotheses.

Release from Proactive Inhibition

Proactive inhibition is a classic and robust experimental effect in research on memory. In the standard Wickens (1973) paradigm, the participants are presented with a triplet of words from the same category such as Chili-Ham-Biscuit for 2 seconds, and then instructed to maintain that triplet in memory while they engage in an unrelated task for 20 seconds (counting backwards from a number). It has been found repeatedly that performance shows decrements on successive trials (see Payne & Wenger, 1998). This pattern has been interpreted in terms of proactive inhibition: The memory traces of words that were encoded earlier in the sequence interfere with encoding of words later in the sequence. However, Wickens (1973) demonstrated that this effect lessens if the semantic category of the words is changed (e.g., from foods to professions). This improvement in recall is called release from proactive inhibition, and it is hypothesized to occur because a category shift causes a shift in attention to an area of the neural network where lateral inhibition has not been building up as rapidly.

The relationship between creativity and performance on the proactive inhibition task was investigated in a pilot study by the present author. Preliminary results demonstrated that the performance of noncreative participants resembled the modal pattern of performance on the proactive inhibition task very closely. However, as opposed to exhibiting the usual decrement that is seen across trials that tap the same semantic category, the performance of creative participants remained relatively constant across trials. This seemed to indicate that proactive (lateral) inhibition may build up at a slower rate in creative participants. Thus, it was hypothesized that creative participants would show lower decrements across trials in a proactive inhibition task. This hypothesis was an indirect test of differences in inhibitory processes between creative and noncreative participants.

Cross-modular Priming

There is a large body of behavioral and neuropsychological evidence that shows that the organization of the cortex is modular (e.g., Desimone & Duncan, 1995; Duncan, 1998; Treisman, 1999). Modularity implies that despite the interconnectedness of cortical structures, different parts of the cortex are specialized for performing specific tasks. Martindale (1989, 1991) has argued that there are modules that are specialized for processing perceptual, episodic, semantic, and other types of information. Modularity enhances the efficiency of information processing by facilitating the exchange of information between nodes that are functionally related. It is hypothesized that information flow among modules is regulated partly by inhibitory processes. For example, if one is involved in the processing of perceptual information, inhibitory processes will make it unlikely that activation will spread to the episodic module (Martindale, 1989, 1991; cf. Dempster, 1991).

Based on neural-network terminology, priming can be defined as follows: The more active a node is, the easier it is to retrieve information related to it (Benjafield, 1997). Behaviorally, priming is manifested by an increased readiness to perform a task due to advance knowledge about it. The concept of priming is related to the concept of "spreading activation" (Anderson, 1984). When one activates a node in a neural network, other nodes that are related positively to that node are activated as well. This characteristic causes activation to spread throughout the network, and allows one to think of relationships among concepts. Inhibitory mechanisms limit the spread of activation to a circumscribed area (Dempster, 1991; Martindale, 1991). Thus, the spread of activation throughout the network is a function of the strength of activation and the inhibitory processes that are operating in the neural network.

If the hypothesis linking lower cognitive inhibition to creative thinking is correct (Esyenck, 1995; Martindale, 1999), then one would expect a higher likelihood of information transfer across modules in creative people compared to noncreative people. Thus, in creative people, if one were to activate a node within a module, nodes in related modules would become activated as a result. It is known that such cross-modular priming is possible because in their work on negative priming, Tipper and Driver (1988) have demonstrated that priming can occur across what they referred to as "symbolic domains" (pictures and words). In this dissertation, the experiment titled *Cross-modular Priming* was conducted to test whether such transfer across modules would occur faster in creative participants.

Interpretation of Ambiguous Stimuli

Kwiatkowski, Vartanian, and Martindale (1999) conducted two experiments to assess the speed of information processing in creative participants. The first experiment involved performance on the Concept Verification Task (Knorr & Neubauer, 1996). In this task, each trial consisted of two steps. In the first step, the participant was presented with a rule, such as "RED and SQUARE," which had to be used to verify the accuracy of the figure which would be presented in the second step. In this particular example, the correct figure was be a red square. The rule remained displayed on the screen until the participant pressed the "Understand" button. Then, a figure was presented which might or might not adhere to the rule, and the participant was instructed to press "Match" or "No Match" in response. The rules varied in complexity, from a simple rule such as "BLUE" to more complex ones such "BLUE or STRIPED, but not both." Two types of reaction time were of interest: The first involved reaction time in understanding the rule, and the second involved reaction time in determining whether the presented figure matched the rule. Results indicated that creative participants were faster in understanding the rule. There was no relationship between creativity and the reaction time for deciding whether the figure matched the rule. Although both steps involved in the Concept Verification Task were unambiguous, the first step was considered to involve conceptual processing, whereas the second step was viewed as a motor response, and was therefore not of interest to the experimenters. The authors interpreted these results as showing that compared to noncreative participants, creative participants showed faster reaction times on an unambiguous task. In essence, the Concept Verification Task was viewed as an example of an unambiguous task.

In their second experiment, Kwiatkowski, Vartanian, and Martindale (1999) investigated the relationship between creativity and performance on a variant of the Stroop task. On each trial of that task, participants were presented with the name of a word in a color that might or might not match the word, and instructed to press a button that corresponded to the color of the word. The task consisted of four types of trials. In the "distractor" type, words were paired randomly (e.g., the word PURPLE in blue was followed by the word GREEN in red). In the "same" type, the same first word was paired with a randomly selected second word (the word ORANGE in blue was always the first word). In the "X condition," sets of letter X in varying length and color were paired (e.g., XXX in blue followed by XX in red). On "negative priming" trials, the name of the first word in the pair (RED in blue) became the color of the second word (GREEN in red). Normally, participants are slower to react to the color of the word on the second half of the negative priming trials compared to their performance on the other trial types. This finding has been interpreted as showing that the inhibition of a response in the first part of the trial requires one to generate more activation than would normally be necessary on the second part.

Investigators have shown that when they are engaged in negative priming tasks, schizophrenic people do not suffer from the same performance decrements that are commonly seen in other populations (e.g., Beech et al, 1989). This finding has been interpreted as evidence for reduced cognitive inhibition in schizophrenics. In other words, it has been argued that in schizophrenic people, inhibition does not build up to the same extent in the first part of the negative priming trial as it does in non-schizophrenic people. Eysenck (1995) predicted that to the extent that schizophrenic and creative people share a tendency toward lower cognitive inhibition, they should perform similarly on negative priming trials. In line with Eysenck's prediction, Kwiatkowski, Vartanian, and Martindale (1999) predicted that on negative priming trials, there would be a negative correlation between creativity and reaction time. It was argued that on this task due to lower cognitive inhibition, the opposite was found. Across all trials (i.e., distractor, same, X condition, and negative priming), there was a *positive* correlation between creativity and reaction time. The authors interpreted these results to mean that creative participants were slower in processing ambiguous or complex stimuli. Presumably, they were less likely to inhibit irrelevant interpretations under such conditions. Using a different experimental paradigm, Smith and van der Meer (1990, 1994) arrived at a similar conclusion. They asked participants to interpret stimuli that were presented very briefly using a tachistoscope, and noticed that creative participants were more likely to offer multiple interpretations in response to the same stimulus.

Kwiatkowski, Vartanian, and Martindale (1999) argued that creative people are slower in processing stimuli that involve ambiguity and/or complexity. In other words, it was concluded that under ambiguous or complex conditions, creative participants slow down because they do not eliminate (i.e., inhibit) potential or competing interpretations quickly. Rather, they tend to maintain competing interpretations in the focus of attention as they work on the task. In the current study, the color tasks were designed to address this issue more systematically. The aim was to determine whether creative participants would be slower in interpreting perceptually ambiguous stimuli.

Hypotheses

The hypotheses in this study fall under two categories: The performance of creative participants under a condition that instructs them to focus attention (dichotic listening task), and the performance of creative participants under conditions where no such instruction is offered (proactive inhibition task, cross-modular priming task, and colors task). In the former case, and based on their performance on the Concept Verification Task (Kwiatkowski, Vartanian, & Martindale, 1999), creative participants were expected to exhibit superior focusing ability. In the latter case, and based on their performance on the negative priming task (Kwiatkowski, Vartanian, & Martindale, 1999), creative participants were hypothesized to exhibit low cognitive inhibition. In the case of the proactive inhibition task, lower cognitive inhibition was hypothesized to lead to lower memory decrements across trials. In the case of cross-modular priming task, lower cognitive inhibition was hypothesized to lead to faster reaction times in assessing the relationship of stimuli that were presented in different modules. In the case of the colors task, lower cognitive inhibition was hypothesized to lead to slower reaction times in identifying ambiguous compared to unambiguous color, and under dual task demands.

Experiments

The method, results, and discussion for each experiment will be presented separately. However, the psychometric assessment tools that were common to all experiments will be presented first.

Psychometric Assessments

Psychometric assessments were conducted on an individual basis. Potential creativity was measured using three paper-and-pencil tasks: First, the participants completed the Alternate Uses Task (Wallach & Kogan, 1965), a widely used measure of divergent thinking. Participants were instructed to list as many uses for three common objects as they could think of in the span of three minutes per object. The three common objects were brick, shoe, and newspaper. The Alternate Uses Task was scored by adding up the uses for the three objects into a total composite score, otherwise known as *fluency*. Research has shown that fluency accounts for most of the variance in divergent thinking tasks (Plucker & Renzulli, 1999). The second measure was the Remote Associates Test

(Mednick & Mednick, 1967). In this test, the participants are presented with three words and instructed to generate a fourth word that is common to all three. For example, the word that is common to "poke", "go", and "molasses" is "slow." The participants were presented with thirty such triplets and given fifteen minutes to complete the task. The score on the Remote Associates Test was calculated by adding up the number of correct responses across the thirty triplets. Thus, scores on this test could range from 0 to 30. Scores on this test also correlate in the .30-.40 range with tests of intelligence (Ginsburg & Whittemore, 1968; Kwiatkowski, Vartanian, & Martindale, 1999). The Creative Personality Scale was the third measure of potential creativity. This measure consists of thirty adjectives--derived from the larger Adjective Check List (Gough, 1979)--which have been shown to be endorsed by more and less creative individuals. Participants were instructed to check those adjectives that described them accurately. Eighteen of the adjectives are associated positively with creativity, whereas the other twelve adjectives are associated negatively with it. Checking a positive adjective results in the addition of one point to the total score, whereas checking a negative adjective results in the subtraction of one point. Thus, scores on the checklist can range from –12 to +18. There was no time limit to this task.

Participants also completed the Eysenck Personality Questionnaire-Revised (EPQ-R; Eysenck & Eysenck, 1994). This 100-item questionnaire generates scores on the three personality dimensions of Extraversion, Neuroticism, and Psychoticism, as well as a social desirability scale called the Lie Scale.

The *Wechsler Abbreviated Scale of Intelligence* (WASI; Wechsler, 1999) is a nationally standardized test of intelligence designed for use with individuals aged 6 to 89 years with an administration time of approximately 30 minutes. The WASI consists of four subtests that tap into various components of intelligence and yields a Verbal, Performance, and Full Scale IQ score. The Verbal Scale includes the Vocabulary and Similarities subtests that measure fund of knowledge, expressive vocabulary, and abstract verbal reasoning abilities. The Block Design and Matrix Reasoning subtests compose the Performance Scale and assess visual-motor coordination, abstract conceptualization, and fluid reasoning. The psychometric properties of the WASI suggest that examiners can have confidence in the accuracy of the obtained IQ scores. Internal consistency reliability coefficients range from .92 to .98 for Verbal IQ, from .94 to .97 for Performance IQ, and from .96 to .98 for the Full Scale IQ score. The standard error of measurement for the 17-24 adult age groups range from 3.73 to 4.15 for the Verbal Scale, from 3.39 to 3.58 for the Performance Scale, and from 2.89 to 2.96 for the Full Scale IQ score. In this study, the standard error of measurement for the Verbal Scale was 1.37, the standard error of measurement for the Performance Scale was 1.31, and the standard error of measurement for the Full Scale was 1.33. The WASI scores posses adequate stability over time for adult samples with coefficients ranging from .88 to .93 for the IQ scales. The WASI has also been found to correlate with the Wechsler Adult Intelligence Scale – Third Edition (Wechsler, 1997: WAIS-III) with coefficients of .88. .84, and .92 for the Verbal, Performance, and Full Scale IQ, respectively.

In this dissertation I shall discuss four experiments: The cross-modular priming task, the proactive inhibition task, the dichotic listening task, and the colors task. The order in which these four experiments were administered was randomized for each participant. The number of participants who completed each experiment ranged from 71 to 79. The eight participants who failed to complete all experiments did so due to a prior condition (color blindness or deafness), equipment malfunction, or erroneous data recording by an experimenter.

Cross-modular Priming Task

Information transfer between modules is mediated by activation and inhibition levels (Martindale, 1991). According to the cognitive disinhibition hypothesis, one would expect to observe lower levels of inhibition between modules in creative compared to noncreative people. Thus, it was hypothesized that if a creative person were presented with a word that depicts an object, activation would spread to other modules that code attributes related to that object, possibly in other modalities that are involved in the processing of pictorial images. Behaviorally, this facilitation would be manifested by faster reaction times in determining whether representations of a concept in two different modules (e.g., the word HAMMER and the picture of a hammer) are related.

Method

Participants

Seventy-nine (31 males, 48 females) right-handed undergraduates enrolled in University of Maine psychology classes volunteered to take part in this experiment. The average age of the sample was 20.1 years (*SD* = 2.2).

Materials

From the 200 stimulus words that appear in *Word Association Norms: Grade School Through College* (Palermo & Jenkins, 1964), 20 that met the following three requirements were selected randomly: First, the stimulus word had to be a noun. Second, one had to be able to change the stimulus word to another meaningful word by replacing one of its letters with any other letter in the alphabet. For example, the stimulus word GUN fulfilled this requirement because it could be changed into FUN, whereas the stimulus word CABBAGE did not. Third, one had to be able to illustrate the stimulus word in the form of an unambiguous black-and-white picture. For example, the stimulus word TABLE fulfilled this requirement whereas HEALTH did not. The final selection consisted of the following twenty stimulus words: table, man, house, hand, lamp, bread, sheep, head, finger, number, shoe, kitten, gun, car, moon, salt, hammer, door, lion, mountain.

Corresponding to each of the twenty stimulus words, the following five types of stimuli were created: First, the word that had the highest association with the stimulus word was selected (see college norms in Palermo & Jenkins, 1964). These were referred to as *semantic* targets. Second, for each stimulus word, a word was created by replacing one of the letters of the stimulus word with another letter in the alphabet to make a novel word. These were referred to as *graphemic* targets (Payne & Wenger, 1998). Third, a black-and-white picture of the stimulus word was selected from the "Clip Art" menu of Microsoft Word. Because the Clip Art menu of Microsoft offers a limited number of pictures for each noun, the experimenter chose the most unambiguous pictorial representation in every case. These were referred to as *pictorial* targets. Fourth, a word that had no association with the stimulus word, meaning that it was not generated as an associate by either male or female college students, was selected at random (see college norms in Palermo & Jenkins, 1964). These were referred to as *unrelated* targets. Finally, the picture of a word that was unrelated to the stimulus word, meaning that it was not generated as an associate by either male or female college students, was selected from the

"Clip Art" menu of Microsoft Word. Because the Clip Art menu of Microsoft offers a limited number of pictures for each noun, the experimenter again chose the most unambiguous pictorial representation in every case. These were referred to as *unrelated pictorial* targets. One stimulus word and its corresponding target stimuli were excluded from final analysis due to a computer-related error in presenting the correct pictorial target. Each stimulus word and its associated word targets were saved initially in size-18 New Courier font and later, along with its corresponding picture targets, in separate Paint files (Microsoft, 2000).

Procedure

The computer program E-prime (Psychology Software Tools, 2000) was used to run the experiment. The stimuli were presented on a 14-inch Sony Trinitron monitor, at a visual angle of 2.1 degrees for the word stimuli and 8.3 degrees for the picture stimuli. The size of words on the screen varied as a function of word length, but the height of letters was kept constant at approximately two centimeters (.8 inches). The approximate size of the picture stimuli on the screen was 8 square centimeters (3.2 square inches). After the participant was seated in front of the computer monitor, the experimenter explained that each trial of this experiment consisted of the presentation of two stimuli in rapid succession, and that the participant's task was to determine whether the two stimuli were related to each other. Participants were instructed to use the number pad and press "1" in response to the detection of a relationship, and to press "2" in the absence thereof. To clarify what was meant by the concept of a relationship, the experimenter presented the participant with examples based on the stimulus word JET. First, the participant was shown an example of an identical target (JET), and told that this was an example of an identity relationship, requiring one to press "1" in response. Then, the participant was shown an example of a semantic target (SPEED), and told that this was an example of a semantic (or meaning) relationship, requiring one to press "1" in response. Then, the participant was shown an example of a graphemic target (GET), and told that this was an example of a word that with the exception of a single letter, resembled the stimulus word, and that it required one to press "1" in response. Then, the participant was shown an example of a pictorial target (picture of a jet), and told that that this was an example of a pictorial relationship, requiring one to press "1" in response. Then, the participant was shown an example of an unrelated target (SHIRT), and told that this was an example of a word that was unrelated to the stimulus word, and thus required one to press "2" in response. Finally, the participant was shown an example of and an unrelated pictorial target (picture of a flower), and told that this was an example of a picture that was unrelated to the stimulus word, and that it required one to press "2" in response. The computer trials were initiated after the participant indicated a clear understanding of the requirements of the experiment. The computer trials began with one set of practice trials, where the participant was given feedback upon the completion of each trial. The practice trials were based on the stimulus word CAKE, which was followed by identical (CAKE), semantic (SWEET), graphemic (FAKE), pictorial (picture of a cake), unrelated (PRINTER), and unrelated pictorial (picture of a drop of water) targets. The order in which the target stimuli were presented in the course of the practice trials was randomized for each participant. After the completion of the practice trials, the participant started the experimental trials by pressing the spacebar. At that point, the following instruction appeared on the screen.

> In this experiment you'll be presented with two words, separated by a "+" sign. Your job is to determine whether the two words are related. Press the "1" button if you think that they are, and the "2" button if you think they are not. The experimenters are interested in the accuracy of your response, as well as your reaction time in making it. Please press the SPACEBAR to proceed.

The experiment was set up in the following way: All stimuli were presented in the center of the screen. Each trial was initiated by the presentation of the *prime* (stimulus word) for one second. The presentation of the prime was then followed by the presentation of a fixation point for one second. Then, the target stimulus was presented, and remained on the screen until the participant made a response. After a response was made, a blank screen was presented for one second, followed by the next trial. Each participant completed 120 trials. The order in which the target stimuli were presented in the course of the experimental trials was randomized for each participant. The computer recorded accuracy and the reaction time associated with each response. For a schematic presentation of a single trial, see Figure 1.

Figure 1. The schematic illustration of a single trial in the cross-modular priming task. In this example, the prime is followed by a semantic target.

Prime	Fixation point	Target	Blank screen
TABLE	+	CHAIR	
1 second	1 second	Variable duration	1 second

Results

Psychometric Assessments

The average score on the Alternate Uses Test was 30.61 (*SD* = 8.77). The average score on the Remote Associates Test was 8.59 (*SD* = 3.87). The average score on the Creative Personality Scale was 5.14 (*SD* = 3.60). Every participant's scores on the three potential creativity measures was standardized and added to form a composite creativity measure, hereafter referred to as "Creativity." There were no gender differences in scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, or Creativity. The average score on the Wechsler Abbreviated Scale of Intelligence-Verbal was 108.52 (*SD* = 10.49). The average score on the Wechsler Abbreviated Scale of Intelligence-Performance was 108.61 (*SD* = 10.31). The average score on the Wechsler Abbreviated Scale of Intelligence-Full was 109.52 (*SD* = 10.02). There were no gender differences on any of the IQ measures. On the EPQ-R, the average score on Extraversion was 15.52 (*SD* = 5.26). The average score on Neuroticism was 12.19 (*SD* = 5.40). The average score on Psychoticism was 7.71 (*SD* = 3.96). The average score on the Lie Scale was 5.80 (*SD* = 3.32). There were no gender differences in scores on Extraversion, Neuroticism, or the Lie Scale, but males (*M* = 9.55, *SD* = 4.05) scored significantly higher than females (*M* = 6.53, *SD* = 3.48) on Psychoticism, t (77) = 3.52, $p < .001$. This difference is in accord with reported norms (see Eysenck & Eysenck, 1994).

For the correlation matrices including the psychometric, creativity, and intelligence measures refer to tables 1 and 2. Note the significant correlation between

Full-scale IQ and scores on the Remote Associates Test, r (57) = .26, $p < .05$, and the significant correlation between Full-scale IQ and Creativity, r (57) = .30, $p < .05$. Also note the significant correlation between Extraversion and scores on the Creative Personality Scale, r (79) = .51, $p < .001$, and the significant correlation between Extraversion and Creativity, r (78) = .34, $p < .01$. Finally, note the significant negative correlation between Neuroticism and scores on the Creative Personality Scale, r (79) = -.24, $p < .05$, and the significant negative correlation between Neuroticism and Creativity, r (78) = -.21, $p < .05$. Positive correlations between Extraversion and measures of creativity, and negative correlations between Neuroticism and measures of creativity, are common and have been reported elsewhere (e.g., Eysenck, 1995; Martindale & Dailey, 1996).

Table 1.Correlation Matrix for Potential Creativity and Intelligence Measures on the Cross-modular Priming Task

	AUT	RAT	CPS	Creativity	Verbal IQ	Performance IQ	Full-scale IQ
AUT							
RAT	.04						
CPS	.17	.07					
Creativity	.63**	.60**	.66**				
Verbal IQ	.17	.19	.09	.25			
Performance IQ	.07	.19	.10	.18	.45**		
Full scale IQ	.16	.26*	.13	.30*	.84**	.85**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale.

* $p < .05$. ** $p < .01$.

Table 2. Correlation Matrix for Potential Creativity and Personality Measures on the Cross-modular Priming Task

	AUT	RAT	CPS	Creativity	E	N	P	L
AUT								
RAT	.04							
CPS	.17	.07						
Creativity	.63**	.60**	.66**					
E	.15	-.01	.51**	.34**				
N	-.15	-.02	-.24*	-.21*	-.30**			
P	0	.18	.20	.20	.06	.11		
L	-.05	-.19	-.01	-.13	.04	-.29*	-.46**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale; E = Extraversion; N = Neuroticism; P = Psychoticism; L = Lie Scale.

* $p < .05$. ** $p < .01$.

Cross-modular Priming

Across all conditions, 88% of responses were correct. The reported analyses were based on those correct responses only.

Four factorial ANOVAs were conducted to determine the effect of scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, and Creativity on reaction time respectively. Because Full-scale IQ, Extraversion, and Neuroticism were correlated significantly with various creativity measures, they were entered as covariates. Scores on the Alternate Uses Test were dichotomized based on a median split. The first factorial ANOVA included Sex, Target Condition (semantic, pictorial, graphemic, unrelated, unrelated pictorial), and scores on the Alternate Uses Test (high vs. low) as fixed factors, and Full-scale IQ, Extraversion, and Neuroticism as covariates. The dependent variable was the difference scores between reaction time on each target condition (semantic, pictorial, graphemic, unrelated, unrelated pictorial) and reaction time on the identity condition for each participant. The decision to use difference scores as the dependent variable was made because reaction time in the identity condition is not a measure of cross-modular priming, but rather a measure of simple reaction time in a stimulus matching task. The results revealed a significant effect for Target Condition, F (4, 267) = 21.12, $p < .001$, and a significant effect for Sex, F (1, 267) = 4.45, $p < .05$. Females had faster reaction times (M = 322.46, SD = 15.76) than males (M = 322.46, SD = 15.76). There was no relationship between scores on the Alternate Uses Test and reaction time. To view this ANOVA, refer to Table 3. To view reaction times within each target condition, refer to Table 4.

Table 3. The Relationship Between Scores on the Alternate Uses Test and Reaction Time on the Cross-modular Priming Task

Source	df	F	Partial Eta Squared
Corrected Model	22	5.73***	.31
Intercept	1	14.13***	.04
Extraversion	1	8.13**	.02
Neuroticism	1	6.94**	.03
Full-scale IQ	1	4.06*	.02
Sex	1	4.45*	.02
Target Condition	5	21.12***	.26
AUT	1	.51	.00
Sex x Target Condition	5	.34	.01
Sex x AUT	1	1.61	.01
Target Condition x AUT	5	.58	.01
Sex x Target Condition x AUT	5	.11	.00
Error	267		
Total	290		
Corrected Total	289		

Note. AUT = Alternate Uses Test

* $p < .05$. ** $p < .01$ *** $p < .001$.

Table 4. Reaction Time Latencies Associated With Scores on the Alternate Uses Test Within Each Target Condition Compared to the Identity Condition

Priming Condition	Alternate Uses Test	Mean	SE
Semantic	Low	290.53	35.06
	High	335.54	33.57
Pictorial	Low	210.48	25.02
	High	202.53	23.95
Graphemic	Low	228.82	30.10
	High	224.35	28.81
Unrelated	Low	439.64	38.23
	High	386.11	36.61
Unrelated Pictorial	Low	524.28	52.17
	High	463.70	49.93

Note. SE = Standard Error. All reaction times are reported in milliseconds.

Scores on the Remote Associates Test were dichotomized based on a median split. The second factorial ANOVA included Sex, Target Condition (identity, semantic, pictorial, graphemic, unrelated, unrelated pictorial), and scores on the Remote Associates Test (high vs. low) as fixed factors, and Full-scale IQ, Extraversion, and Neuroticism as covariates. The dependent variable was the difference scores between reaction time on each target condition (semantic, pictorial, graphemic, unrelated, unrelated pictorial) and reaction time on the identity condition for each participant. The results revealed a significant effect for Target Condition, $F\ (4, 262) = 21.76, p < .001$, and a significant effect for scores on the Remote Associates Test, $F(1, 262) = 11.09, p < .01$. Participants who had higher scores on the Remote Associates Test were faster (*M* = 289.98, *SD* = 257.95) than those who had lower scores (*M* = 367.34, *SD* = 335.52) on this task. To view this ANOVA, refer to Table 5. To view reaction times within each target condition, refer to Table 6.

Table 5. The Relationship Between Scores on the Remote Associates Test and Reaction Time on the Cross-modular Priming Task

Source	Df	F	Partial Eta Squared
Corrected Model	22	6.03***	.34
Intercept	1	3.44	.01
Extraversion	1	11.64**	.03
Neuroticism	1	5.26*	.01
Full-scale IQ	1	.12	.01
Sex	1	2.77	.01
Target Condition	4	21.76***	.25
RAT	1	11.09**	.03
Sex x Target Condition	4	.27	.01
Sex x RAT	1	1.87	.01
Target Condition x RAT	4	.28	.01
Sex x Target Condition x RAT	4	.19	.01
Error	262		
Total	285		
Corrected Total	284		

Note. RAT = Remote Associates Test

* $p < .05$ ** $p < .01$ *** $p < .001$.

Table 6. Reaction Time Latencies Associated With Scores on the Remote Associates Test Within Each Target Condition Compared to the Identity Condition

Priming Condition	Remote Associates Test	Mean	SE
Semantic	Low	347.92	34.80
	High	276.23	35.03
Pictorial	Low	238.52	24.36
	High	175.86	24.50
Graphemic	Low	265.07	29.14
	High	192.08	29.32
Unrelated	Low	439.11	37.77
	High	379.73	38.02
Unrelated Pictorial	Low	546.14	51.26
	High	425.95	51.58

Note. SE = Standard Error. All reaction times are reported in milliseconds.

Scores on the Creative Personality Scale were dichotomized based on a median split. The third factorial ANOVA included Sex, Target Condition (identity, semantic, pictorial, graphemic, unrelated, unrelated pictorial), and scores on the Creative Personality Scale (high vs. low) as fixed factors, and Full-scale IQ, Extraversion, and Neuroticism as covariates. The dependent variable was the difference scores between reaction time on each target condition (semantic, pictorial, graphemic, unrelated, unrelated pictorial) and reaction time on the identity condition for each participant. The results revealed a significant effect for Target Condition, F (4, 267) = 23.57, $p < .001$, and a significant effect for Sex, $F(1, 267) = 5.33, p < .05$. Females had faster reaction times ($M = 302.23$, $SD = 14.89$) than males ($M = 355.09$, $SD = 17.05$). There was no relationship between scores on the Creative Personality Scale and reaction time. To view this ANOVA, refer to Table 7. To view reaction times within each target condition, refer to Table 8.

Table 7. The Relationship Between Scores on the Creative Personality Scale and Reaction Time on the Cross-modular Priming Task

Source	Df	F	Partial Eta Squared
Corrected Model	22	6.14***	.34
Intercept	1	12.31**	.03
Extraversion	1	5.78*	.01
Neuroticism	1	5.61*	.01
Full-scale IQ	1	3.45	.00
Sex	1	5.33*	.01
Target Condition	4	23.57***	.25
CPS	1	.17	.00
Sex x Target Condition	4	.50	.01
Sex x CPS	1	1.55	.01
Target Condition x CPS	4	.88	.00
Sex x Target Condition x CPS	4	1.81	.03
Error	267		
Total	290		
Corrected Total	289		

Note. CPS = Creative Personality Scale

* $p < .05$. ** $p < .01$ *** $p < .001$.

Table 8. Reaction Time Latencies Associated With Scores on the Creative Personality Scale Within Each Target Condition Compared to the Identity Condition

Priming Condition	Creative Personality Scale	Mean	SE
Semantic	Low	315.25	35.89
	High	309.93	38.25
Pictorial	Low	198.03	25.83
	High	212.16	27.54
Graphemic	Low	244.23	30.11
	High	206.07	32.10
Unrelated	Low	398.73	39.42
	High	422.91	42.03
Unrelated Pictorial	Low	459.16	52.98
	High	520.11	56.47

Note. SE = Standard Error. All reaction times are reported in milliseconds.

Scores on Creativity were dichotomized based on a median split. The third factorial ANOVA included Sex, Target Condition (identity, semantic, pictorial, graphemic, unrelated, unrelated pictorial), and Creativity (high vs. low) as fixed factors, and Full-scale IQ, Extraversion, and Neuroticism as covariates. The dependent variable was the difference scores between reaction time on each target condition (semantic, pictorial, graphemic, unrelated, unrelated pictorial) and reaction time on the identity condition for each participant. The results revealed a significant effect for Target Condition, $F\,(4, 262) = 21.09, p < .001$, and a significant effect for Sex, $F\,(1, 262) =$

4.32, $p < .05$. Females had faster reaction times ($M = 303.50$, $SD = 17.78$) than males ($M = 352.57$, $SD = 15.11$). To view this ANOVA, refer to Table 9. To view reaction times within each target condition, refer to Table 10.

Table 9. The Relationship Between Scores on Creativity and Reaction Time on the Cross-modular Priming Task

Source	df	F	Partial Eta Squared
Corrected Model	22	5.29***	.31
Intercept	1	10.29**	.04
Extraversion	1	7.84**	.03
Neuroticism	1	6.57*	.03
Full-scale IQ	1	2.52	.01
Sex	1	4.32*	.02
Target Condition	4	21.09***	.23
Creativity	1	.02	.00
Sex x Target Condition	4	.29	.01
Sex x Creativity	1	1.67	.01
Target Condition x Creativity	4	.23	.00
Sex x Target Condition x Creativity	4	.23	.00
Error	262		
Total	285		
Corrected Total	284		

* $p < .05$. ** $p < .01$ *** $p < .001$.

Table 10. Reaction Time Latencies Associated With Scores on Creativity Within Each Target Condition Compared to the Identity Condition

Priming Condition	Creativity	Mean	SE
Semantic	Low	311.02	35.52
	High	316.92	36.70
Pictorial	Low	215.18	25.59
	High	194.40	26.42
Graphemic	Low	232.06	30.83
	High	222.01	31.85
Unrelated	Low	410.92	39.25
	High	403.96	40.57
Unrelated Pictorial	Low	478.96	53.65
	High	491.86	55.42

Note. SE = Standard Error. All reaction times are reported in milliseconds.

Finally, a separate factorial ANOVA was conducted to investigate the effect of Psychoticism on reaction time. Scores on Psychoticism were dichotomized based on a median split. The factorial ANOVA included Sex, Target Condition (identity, semantic, pictorial, graphemic, unrelated, unrelated pictorial), and Psychoticism (high vs. low) as fixed factors, and Full-scale IQ, Extraversion, and Neuroticism as covariates. The dependent variable was the difference scores between reaction time on each target condition (semantic, pictorial, graphemic, unrelated, unrelated pictorial) and reaction time on the identity condition for each participant. The results revealed a significant effect for Target Condition, $F(4, 267) = 19.77, p < .001$. There was no relationship between Psychoticism and reaction time. To view this ANOVA, refer to Table 11. To view reaction times within each target condition, refer to Table 12.

Table 11. The Relationship Between Scores on Psychoticism and Reaction Time on the Cross-modular Priming Task

Source	df	F	Partial Eta Squared
Corrected Model	22	5.80***	.31
Intercept	1	13.31***	.05
Extraversion	1	6.79*	.03
Neuroticism	1	6.07*	.01
Fill-scale IQ	1	3.80	.00
Sex	1	2.43	.01
Target Condition	4	19.77***	.23
Psychoticism	1	1.91	.01
Sex x Target Condition	4	.39	.01
Sex x Psychoticism	1	3.06	.00
Target Condition x Psychoticism	4	.21	.00
Sex x Target Condition x Psychoticism	4	.22	.00
Error	267		
Total	290		
Corrected Total	289		

* $p < .05$ *** $p < .001$.

Table 12. Reaction Time Latencies Associated With Scores on Psychoticism Within Each Target Condition Compared to the Identity Condition

Priming Condition	Psychoticism	Mean	SE
Semantic	Low	277.18	38.17
	High	336.70	34.40
Pictorial	Low	191.03	27.27
	High	204.13	24.56
Graphemic	Low	189.68	35.50
	High	248.11	29.29
Unrelated	Low	394.10	42.22
	High	417.10	38.05
Unrelated Pictorial	Low	469.29	57.42
	High	485.10	51.75

Note. SE = Standard Error. All reaction times are reported in milliseconds.

Discussion

The results indicated that Target Condition had an effect on reaction time. The results also indicated that averaged across all priming conditions, participants who had higher scores on the Remote Associates Test were faster in determining whether stimuli that were presented in pairs were related. However, those with higher scores on the Remote Associates Test were not faster compared to those with lower scores within any target condition. Thus, it appears that when creativity is defined in terms of higher scores on the Remote Associates Test, the speed advantage that was exhibited by creative participants does not vary as a function of the way in which two stimuli are related. Investigating the difference in reaction time between creative and noncreative participants in the pictorial condition was of particular interest, because that condition is clearly a measure of cross-modular priming (see Tipper & Driver, 1982). The observation that when defined by scores on the Remote Associates Test creativity was not associated with reaction time on the pictorial condition implies that creative people may be faster in observing relationships between stimuli in general, but not faster in doing so across different modalities.

In addition, three of the ANOVAs revealed that females had faster reaction times than males. Although females are known to excel in some reaction time tasks compared to males (e.g., Larson & Saccuzzo, 1986), the observed gender difference in reaction time on the cross-modular priming task was not predicted.

Proactive Inhibition Task

According to the cognitive disinhibiton hypothesis, creative people have lower levels of cognitive inhibition in their neural networks (Eysenck, 1995; Martindale, 1995). The cognitive disinhibition hypothesis does not address the *buildup* of lateral inhibition directly. Rather, it is a hypothesis about the baseline of activation within the neural network. This experiment was conducted to determine whether there is difference between creative and noncreative people in the rate at which proactive inhibition accumulates in neural networks.

Method

Participants

Seventy-eight (30 males, 48 females) right-handed undergraduates enrolled in University of Maine psychology classes volunteered to take part in this experiment. The average age of the sample was 20.6 years (*SD* = 3.9).

Materials

The stimuli that were used in this experiment were words that were organized into five groups. Each group consisted of three words, referred to as a *triplet*. Four groups were triplets that belonged to the same semantic category (i.e., food), and a fifth group was a triplet that belonged to a different semantic category (i.e., body parts). The latter triplet will be referred to as the *test triplet*. Three of the triplets that were used in this experiment were obtained from Wickens (1973). A fourth triplet (Pie Cheese Sauce) was generated by the experimenter by selecting three words that belonged to the food category at random. The triplets that were used in this experiment are: Chili Ham Biscuit, Bread Apple Beans, Crackers Sausage Corn, Pie Cheese Sauce, Finger Eye Ankle. In addition, the experimenter also generated 5 random three-digit numbers that would be used in the mental subtraction task, to be discussed shortly. Those numbers were: 147, 162, 254, 317, and 329. Each stimulus word triplet was saved in size 18 New Courier font, and labeled accordingly in a separate Paint file (Microsoft, 2000).

Procedure

The computer program E-prime (Psychology Software Tools, 2000) was used to run the experiment. The stimuli were presented on a 14-inch Sony Trinitron monitor, at a visual angle of 2.1 degrees. The size of the triplets on the screen varied as a function of triplet length, but the height of letters was kept constant at approximately two centimeters (.8 inches). After the participant was seated in front of the computer monitor, the experimenter explained that in this experiment, each trial would begin with a 2-s presentation of a fixation point. Then, three words placed adjacent to one another would appear on the screen for 2 s, followed immediately by the presentation of a three-digit number on the screen for 20 s. While the number remained on the screen, the participant was instructed to subtract from it by threes, and to do so as quickly as possible. Following this 20-s period, a "?" would appear on the screen for 6 s, at which point the participant was instructed to do two things: First, to say the number which he or she had counted down to (as a result of the subtraction process); second, to repeat the three words that were presented at the beginning of the trial. At this point the computer would start a new trial. The task would end after the completion of five trials. Except for the test trial, the order in which the first four triplets were presented, and the three-digit numbers presented on each trial, were randomized for each participant. Figure 2 illustrates a hypothetical trial.

Figure 2. An example of a single trial in the proactive inhibition task.

Fixation point	Word triplet	Three-digit number	Response
*	Chili Ham Biscuit	147	?
2 seconds	2 seconds	20 seconds	6 seconds

The computer trials began after the participant indicated a clear understanding of the instructions. To minimize the introduction of additional verbal material that might have increased semantic interference, this experiment did not include any practice trials. The participant started the experimental trials by pressing the spacebar. At that point, the following instruction appeared on the screen:

> In this experiment, we are interested in your ability to remember words, and to count backward by threes. You should try to do as well as possible on both tasks. You will complete five trials. Each trial will begin with the presentation of an asterisk. If you are ready to begin, please press the SPACEBAR.

Those instructions were followed by a second set of instructions:

> On each trial, you will be presented with three words, followed by a number. For as long as the number is visible on the screen, subtract from it by THREES. As soon as the number disappears from the screen, recall the three words by speaking into the microphone. If you are ready to begin, press the SPACEBAR.

The experimenter recorded the responses of the participants-which consisted of the result of the mathematical subtraction task and memory for the word triplets-at the end of each trial.

Results

Psychometric Assessments

The average score on the Alternate Uses Test was 30.68 (*SD* = 8.96). The average score on the Remote Associates Test was 8.53 (*SD* = 3.82). The average score on the Creative Personality Scale was 5.26 (*SD* = 3.53). Every participant's scores on the three potential creativity measures was standardized and added to form a composite creativity measure, hereafter referred to as "Creativity." There were no gender differences in scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, or Creativity. The average score on the Wechsler Abbreviated Scale of Intelligence-Verbal was 108.72 (*SD* = 10.54). The average score on the Wechsler Abbreviated Scale of Intelligence-Performance was 108.47 (*SD* = 10.32). The average score on the Wechsler Abbreviated Scale of Intelligence-Full was 109.53 (*SD* = 10.10). There were no gender differences on any of the IQ measures. The average score on Extraversion was 15.58 (*SD* = 5.25). The average score on Neuroticism was 12.22 (*SD* = 5.52). The average score on Psychoticism was 7.80 (*SD* = 4.00). The average score on the Lie Scale was 5.81 (*SD* = 3.35). There were no gender differences in scores on Extraversion, Neuroticism, or the Lie Scale, but males ($M = 9.79$, $SD = 4.04$) scored significantly higher than females ($M = 6.43$, $SD = 3.48$) on Psychoticism, $t\,(76) = 3.78$, $p < .001$. This difference is in accord with previously reported norms (see Eysenck & Eysenck, 1994). For the correlation matrices including the psychometric, creativity, and intelligence measures, refer to Tables 13 and 14.

Table 13. Correlation Matrix for Potential Creativity and Intelligence Measures on the Proactive Inhibition Task

	AUT	RAT	CPS	Creativity	Verbal IQ	Performance IQ	Full scale IQ
AUT							
RAT	.03						
CPS	.24*	.13					
Creativity	.66**	.58**	.70**				
Verbal IQ	.19	.21	.12	.25*			
Performance IQ	.05	.17	.13	.19	.44**		
Full scale IQ	.16	.27*	.17	.30*	.84**	.85**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale.

* $p < .05$. ** $p < .01$.

Table 14. Correlation Matrix for Potential Creativity and Personality Measures on the Proactive Inhibition Task

	AUT	RAT	CPS	Creativity	E	N	P	L
AUT								
RAT	.03							
CPS	.24*	.13						
Creativity	.66**	.58**	.70**					
E	.16	0	.47**	.33**				
N	-.11	-.04	-.19*	-.18*	-.28**			
P	.08	.20	.19	.25*	.03	.14		
L	-.06	-.17	-.02	-.13	.05	-.28**	-.48**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale; E = Extraversion; N = Neuroticism; P = Psychoticism; L = Lie Scale.

* $p < .05$. ** $p < .01$.

Note the significant correlation between Verbal IQ and Creativity, r (57) = .25, $p < .05$. Also, note the significant correlation between full-scale IQ and scores on the Remote Associates Test, r (57) = .27, $p < .05$, and the significant correlation between Full-scale IQ and Creativity, r (57) = .30, $p < .05$. Also note the significant correlation between Extraversion and scores on the Creative Personality Scale, r (79) = .47, $p < .001$, and the significant correlation between Extraversion and Creativity, r (78) = .33, $p < .01$. Finally, note the significant correlation between Psychoticism and Creativity, r (78) = .25, $p < .05$. Positive correlations between Extraversion and Creativity, and positive correlations between Psychoticism and Creativity, are common and have been reported elsewhere (e.g., Eysenck, 1995; Martindale & Dailey, 1996).

Computer Tasks

The proactive inhibition task involved performance across five trials. Four separate ANOVAs were conducted to determine the effect of scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, and Creativity on performance across trials. Because Full-scale IQ, Extraversion, and Psychoticism were correlated significantly with various creativity measures (see above), they were entered as covariates. In addition, to control for the rate of subtraction on each trial, the difference between the presented number (i.e., 147, 162, 254, 317, or 329) and the participant's response was entered as a covariate. Despite the significant correlation between Verbal IQ and Creativity, the former was not entered as a covariate into the analyses because it is included in the Full-scale IQ measure. Scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, and Creativity were dichotomized based on median splits. Apart from including the dichotomized potential creativity measure of interest as a fixed factor, each ANOVA included Sex as a fixed factor, Trial as a repeated measures variable, and Full-scale IQ, Extraversion, and Psychoticism, and Subtraction Rate as covariates. The dependent variable was the number of words recalled on each trial. The effect for scores on the Creative Personality Scale was significant, $F(1, 31) = 6.08, p < .05$. To view the within-subjects and between-subjects ANOVA's, refer to Table 15 and Table 16 respectively. Averaged across all trials, participants with higher scores on the Creative Personality Scale recalled 2.06 ($SD = .60$) words, and those with lower scores recalled 2.04 ($SD = .57$) words. When analyzed on a trial-by-trial basis, the difference between those who scored higher versus lower on the Creative Personality Scale was significant on the third trial only, $F(1, 50) = 4.45, p < .05$ (see Figure 3), where those with *lower* scores on the Creative Personality Scale recalled more words ($M = 1.87$, $SD = 1.09$) compared to those with higher scores ($M = 1.56$, $SD = 1.03$). To view the relationship between scores on the Creative Personality Scale and performance on the third trial, refer to Table 17. The effect for none of the other potential creativity measures reached significance.

Table 15. The Relationship Between Scores on the Creative Personality Scale and Performance on the Proactive Inhibition Task: Tests of Within-Subjects Effects

Source	df	F
Trial	4	1.14
Trial x Full-scale IQ	4	1.03
Trial x Psychoticism	4	1.73
Trial x Extraversion	4	1.36
Trial x Covariance 1	4	4.42**
Trial x Covariance 2	4	.73
Trial x Covariance 3	4	1.07
Trial x Covariance 4	4	.33
Trial x Covariance 5	4	2.68*
Trial x Sex	4	.70
Trial x Creative Personality Scale	4	1.46
Trial x Sex x Creative Personality Scale	4	1.26
Error	124	

Note. Covariance 1 = Rate of mental subtraction on Trial 1; Covariance 2 = Rate of mental subtraction on Trial 2; Covariance 3 = Rate of mental subtraction on Trial 3; Covariance 4 = Rate of mental subtraction on Trial 4; Covariance 5 = Rate of mental subtraction on Trial 5.

* $p < .05$ ** $p < .01$.

Table 16. The Relationship Between Scores on the Creative Personality Scale and Performance on the Proactive Inhibition Task: Tests of Between-Subjects Effects

Source	df	F
Intercept	1	.20
Full-scale IQ	1	1.85
Psychoticism	1	1.48
Extraversion	1	5.52*
Covariance 1	1	.06
Covariance 2	1	.25
Covariance 3	1	.38
Covariance 4	1	1.62
Covariance 5	1	2.90
Sex	1	.08
Creative Personality Scale	1	6.08*
Sex x Creative Personality Scale	1	3.24
Error	31	

Note. Covariance 1 = Rate of mental subtraction on Trial 1; Covariance 2 = Rate of mental subtraction on Trial 2; Covariance 3 = Rate of mental subtraction on Trial 3; Covariance 4 = Rate of mental subtraction on Trial 4; Covariance 5 = Rate of mental subtraction on Trial 5.

* $p < .05$.

Figure 3. A comparison of the performance of participants scoring high and low on the Creative Personality Scale on the proactive inhibition task.

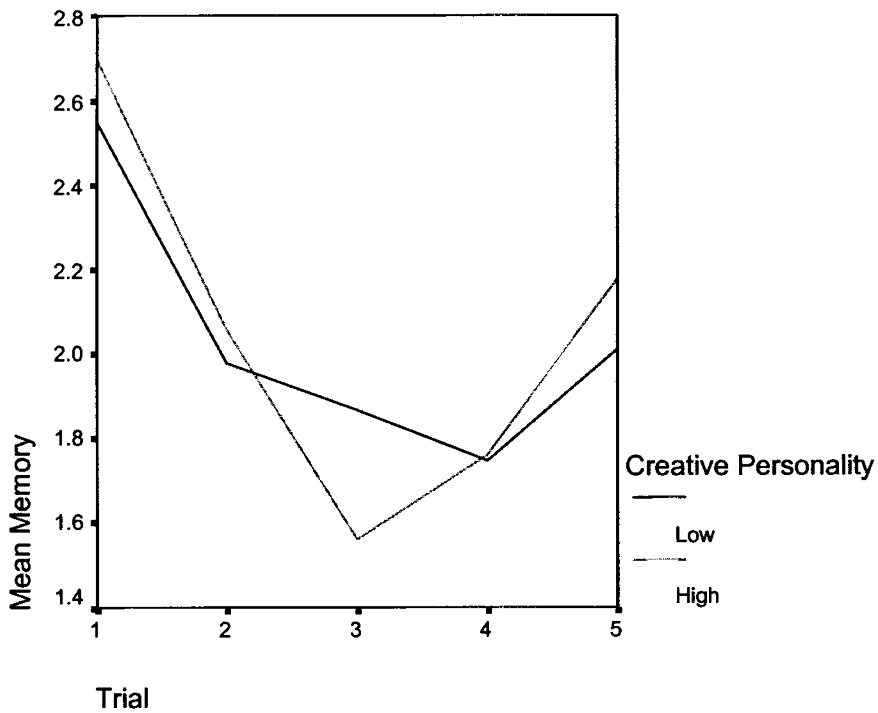


Table 17. The Relationship Between Scores on the Creative Personality Scale and Performance on the Third Trial of the Proactive Inhibition Task

Source	df	F
Corrected Model	6	1.75
Intercept	1	1.01
Full-scale IQ	1	3.97
Extraversion	1	2.54
Psychoticism	1	2.10
Sex	1	.01
Creative Personality Scale	1	4.50*
Sex x Creative Personality Scale	1	.14
Error	50	
Total	57	
Corrected Total	56	

* $p < .05$

Discussion

The results showed that participants who had lower scores on the Creative Personality Scale had better memory for words on the third trial of the proactive inhibition task. This finding contradicted the hypothesis, according to which creative participants were predicted to show lower performance decrements across five trials. According to the working hypothesis of this dissertation, creativity is associated with lower levels of cognitive inhibition in neural networks. However, that hypothesis says little about the *buildup* of proactive inhibition within a semantic network-a process that has been hypothesized to underlie the effect seen in the proactive inhibition task (Wickens, 1973). Thus, it may be argued that a theoretical dissociation must be made between the variability in the level of cognitive inhibition-which is the focus of the disinhibition theory of creativity-and the buildup of lateral inhibition within the network. Because the performance of creative participants showed a marked drop on the third trial, per hypothesis one must assume that lateral inhibition within the networks of creative participants must have reached a maximum on that trial. The disinhibition theory of creativity cannot account for that observation. Moreover, it is not clear why compared to the third trial, the performance of creative participants showed an improvement on the fourth trial, *prior* to category switch. Because release from proactive inhibition is hypothesized to occur as a result of semantic category switch, it is not clear why an improvement in memory performance would be observed in the absence of that switch.

Dichotic Listening Tasks

Two types of dichotic listening tasks were used in this experiment: The word list task and the prose task. With minor alterations, both tasks were modeled after the ones used by Dykes and McGhie (1976). The order in which the two tasks were administered was randomized for each participant.

The dichotic listening tasks that were used in the current experiment did not include repeated words. Moreover, all data were collected in the focused attention condition. Thus, if creative participants were to remember more words from the unshadowed channel under conditions that are minimally conducive to good memory performance, there would be strong reason to believe that they have a lower ability to inhibit the entry of irrelevant information into the focus of attention. Martindale (1999) has argued that creative people can focus or defocus attention depending on situational demands. Thus, when provided with cues to focus attention, they can do so successfully. For this dissertation, the design of the dichotic listening task employed the "focused attention" method, where participants are given clear instruction to attend to the contents of one message only. Thus, it was hypothesized that creative participants would have better memory for words that were presented to the *shadowed* channel because they would focus their attention on the relevant message. This hypothesis contradicted the hypothesis derived from Eysenck's (1995) theory, according to which creative participants would have better memory for words that were presented to the unshadowed channel despite the provision of instruction to ignore the content of the irrelevant message.

Word List Task

Method

Participants

Seventy-one (29 males, 42 females) right-handed undergraduates enrolled in University of Maine psychology classes volunteered to take part in this experiment. The average age of the sample was 20.2 years (*SD* = 2.3). The participants were a subset of the 74 participants who completed the Prose Task. The data from three participants who had completed both tasks were discarded from analysis in the Word List Task due to errors in data collection.

Materials

Forty-eight monosyllabic four-letter stimulus words were selected randomly from *Word Association Norms: Grade School Through College* (Palermo & Jenkins, 1964). The 48 words were placed randomly into either the *high association* or the *low association* group. Each word in the high association group was paired with the four-letter word with which it had the highest association (see Palermo & Jenkins, 1964). In turn, each word in the low association group was paired up with a four-letter word with which it had no association, meaning that it was not generated as an associate to the stimulus word by either male or female college students (see Palermo & Jenkins, 1964). This procedure resulted in a list of 48 word pairs, half of which had a high association and half of which had a low association with each other. Then, the word pairs were assigned randomly to two word lists with the requirement that each word list contain 24 of the initial stimulus words. The lists were labeled Word List 1 and Word List 2. An audio recording of each word list was prepared using the experimenter's voice. The words were pronounced at the rate of approximately one word per second. Each recording was approximately 50 s long. The audio recordings of the word lists were synchronized such that when the tapes were played simultaneously, each word pair would be heard simultaneously. The synchronization process was achieved by placing a stopwatch in front of the experimenter as he vocalized the words at the rate of approximately one word per second. Finally, the recording process was repeated until the simultaneous presentation of the word lists resulted in the simultaneous presentation of each word pair throughout the lists.

To test for memory of the words that were presented on Word List 1 and Word List 2, a separate list was prepared that contained the 96 words that comprised the 48 stimulus-associate pairs, and 20 four-letter monosyllabic words, referred to as *control words*. The control words consisted of words that were recalled with equal frequency to each other in a pilot study. The 116 words that appeared on this last were printed in alphabetical order. This list was referred to as the *Word Test List*.

Two Walkmans and two mono earphones were used for presenting the recordings.

Procedure

The experiment was conducted in a quiet room. The participant was told that he or she would be presented with a different message to each ear simultaneously and that he or she was required to repeat the words that were presented to one ear only. The participant was told that the repetition process had to be sufficiently loud such that it would be audible to the experimenter. The to-be-shadowed ear (left vs. right) and message (Word List A vs. Word List B) were randomized for each participant. The experimenter then cleaned the earphones, and demonstrated the manner in which they were to be placed in each ear. The experimenter then pressed the "Play" button on each Walkman simultaneously, and waited until the last word that was presented to the shadowed ear was repeated. At this point, the participant was instructed to remove the earphones, and was presented with the Word Test List and instructed to "Please place a checkmark next to every word that you remember hearing in either ear." The participant was allowed to work on the Test List at his or her own pace.

Prose Task

Method

Participants

Seventy-four (30 males, 44 females) right-handed undergraduates enrolled in University of Maine psychology classes volunteered to take part in this experiment. The average age of the sample was 20.3 years (*SD* = 2.4).

Materials

Ten four-letter stimulus words that were not used in the word list task were selected from *Word Association Norms: Grade School Through College* (Palermo & Jenkins, 1964). The words were placed randomly into either the high association or the low association group. Each word in the high association group was paired with the four-letter word with which it had the highest association (see Palermo & Jenkins, 1964). In turn, each word in the low association group was paired with a word with which it had no association, meaning that it was not generated as an associate to the stimulus word by either male or female college students (see Palermo & Jenkins, 1964). This procedure, which was reported in Dykes and McGhie (1976), created a list of ten word pairs, half of which had a high semantic association and half of which had a low semantic association with each other. Then, the word pairs were assigned randomly to two word lists with the requirement that each word list contain five of the initial stimulus words. These two lists were referred to as Prose Passage 1 and Prose Passage 2. Then, two passages of prose were prepared by embedding the words within each list at various locations within a passage, and ensuring that its pair occurred at the exact same location in the other passage. The procedure resulted in the creation of two passages of equal length, which were labeled Prose Passage 1 and Prose Passage 2. An audio recording of each passage was made using the experimenter's voice. The words were pronounced at the rate of approximately one word per second. This pronunciation rate was similar to the rate employed by Dykes and McGhie (1976). Each recording was approximately 120 s long. The recording of the words was synchronized such that when the tapes were played simultaneously, each word pair would be heard simultaneously. The synchronization process was achieved in the following way: First, the tapes used for each passage were identical. Second, the recordings were conducted on the same audio equipment. Third, the recordings were carried out by placing a stopwatch in front of the experimenter as he vocalized the words at the rate of approximately one word per second. Finally, the recording process was repeated until the simultaneous presentation of the prose passages resulted in the simultaneous presentation of word pairs throughout the lists.

A list was prepared that contained the 20 words embedded in Prose Passage 1 and Prose Passage 2, as well as 10 monosyllabic four-letter words that were referred to as *control words*. The control words consisted of words that were recalled with equal frequency to each other in a pilot study. The 30 words that appeared on this list were presented in alphabetical order.

Two Walkmans and two mono earphones were used for presenting the recordings.

Results

Common

The following four factorial ANOVAs were conducted first: In the first ANOVA, the percentage of words remembered from the shadowed ear was entered as the dependent variable. Condition (word vs. prose), Order (first task vs. second task), attended Channel (right ear vs. left ear), Message (1 vs. 2), and Sex were entered as fixed factors. To control for the tendency to over-report, the percentage of words recognized from the control words (that were in neither message) was entered as the covariate. The effect for Condition was significant, $F(1, 81) = 36.33, p < .001$. Participants had better memory for words presented in prose ($M = 60.96$, $SD = 2.70$) than they did for words presented in word lists ($M = 35.67$, $SD = 2.78$). To view the ANOVA, refer to Table 18.

Table 18. A Comparison of Memory for Words Presented to the Shadowed Channel Across the Word List and Prose Conditions

Source	df	F
Corrected Model	30	3.80***
Intercept	1	260.73***
Percent Control Words	1	39.92***
Condition	1	36.33***
Order	1	3.78
Channel	1	.54
Message	1	1.35
Sex	1	.10
Condition x Order	1	2.24
Condition x Channel	1	.08
Order x Channel	1	.22
Condition x Order x Channel	1	.02
Condition x Message	1	.18
Order x Message	1	.35
Condition x Order x Message	1	.08
Channel x Message	1	.07
Condition x Channel x Message	1	.76
Order x Channel x Message	1	.07
Condition x Order x Channel x Message	1	.89
Condition x Sex	1	.00

Table 18. Continued

Order x Sex	1	.52
Condition x Order x Sex	1	1.43
Channel x Sex	1	.06
Condition x Channel x Sex	1	1.55
Order x Channel x Sex	1	.81
Message x Sex	1	.92
Condition x Message x Sex	1	1.64
Order x Message x Sex	1	.02
Condition x Order x Message x Sex	0	.
Channel x Message x Sex	1	.68
Condition x Channel x Message x Sex	0	.
Order x Channel x Message x Sex	0	.
Condition x Order x Channel x Message x Sex	0	.
Error	81	
Total	112	
Corrected Total	111	

** $p < .01$ *** $p < .001$

In the second ANOVA, the percentage of words remembered from the unshadowed ear was entered as the dependent variable. Condition (word vs. prose), Order (first vs. second), Channel (right vs. left), Message (1 vs. 2), and Sex were entered as fixed factors. To control for the tendency to over-report, the percentage of words recognized from the control words (that were in neither message) was entered as the covariate. The effect for Condition was significant, $F(1, 81) = 9.46, p < .01$. Participants had better memory for words presented in prose ($M = 34.27$, $SD = 2.76$) than they did for words presented in word lists ($M = 20.18$, $SD = 2.86$). To view the ANOVA, refer to Table 19.

Table 19. A Comparison of Memory for Words Presented to the Unshadowed Channel Across the Word List and Prose Conditions

Source	df	F
Corrected Model	30	4.50***
Intercept	1	39.04***
Percent Control Words	1	57.57***
Condition	1	9.46**
Order	1	1.71
Channel	1	.00
Message	1	1.65
Sex	1	2.44
Condition x Order	1	.09
Condition x Channel	1	.39
Order x Channel	1	.00
Condition x Order x Channel	1	.04
Condition x Message	1	2.32
Order x Message	1	.60
Condition x Order x Message	1	.10
Channel x Message	1	.03
Condition x Channel x Message	1	.04
Order x Channel x Message	1	.01
Condition x Order x Channel x Message	1	.00
Condition x Sex	1	1.83

Table 19. Continued

Order x Sex	1	1.42
Condition x Order x Sex	1	.04
Channel x Sex	1	.01
Condition x Channel x Sex	1	1.35
Order x Channel x Sex	1	.28
Condition x Order x Channel x Sex	0	
Message x Sex	1	1.89
Condition x Message x Sex	1	.04
Order x Message x Sex	1	.21
Condition x Order x Message x Sex	0	.
Channel x Message x Sex	1	.07
Condition x Channel x Message x Sex	0	
Order x Channel x Message x Sex	0	.
Condition x Order x Channel x Message x Sex	0	.
Error	81	.
Total	112	
Corrected Total	111	

** $p < .01$ *** $p < .001$

In the third ANOVA, the percentage of high-association words that were recalled from the unshadowed ear was entered as the dependent variable. Condition (word vs. prose), Order (first vs. second), Channel (right vs. left), Message (1 vs. 2), and Sex were entered as fixed factors. To control for the tendency to over-report, the percentage of words recognized from the control words (that were in neither message) was entered as the covariate. The effect for Condition was significant, $F(1, 81) = 34.64, p < .001$. Participants had better memory for words presented in prose ($M = 55.84$, $SD = 4.59$) than they did for words presented in word lists ($M = 16.57$, $SD = 4.74$). To view the ANOVA, refer to Tale 20.

Table 20. A Comparison of Memory for High-association Words Presented to the Unshadowed Channel Across the Word List and Prose Conditions

Source	df	F
Corrected Model	30	4.27***
Intercept	1	43.77***
Percent Control Words	1	16.29***
Condition	1	34.64***
Order	1	2.42
Channel	1	8.49**
Message	1	14.26***
Sex	1	2.85
Condition x Order	1	.07
Condition x Channel	1	.87
Order x Channel	1	.01
Condition x Order x Channel	1	1.08
Condition x Message	1	6.17*
Order x Message	1	.55
Condition x Order x Message	1	1.39
Channel x Message	1	1.67
Condition x Channel x Message	1	4.58*
Order x Channel x Message	1	1.55
Condition x Order x Channel x Message	1	.43
Condition x Sex	1	7.63**

Table 20. Continued

Order x Sex	1	.32
Condition x Order x Sex	1	.07
Channel x Sex	1	.33
Condition x Channel x Sex	1	1.15
Order x Channel x Sex	1	.53
Condition x Order x Channel x Sex	0	.
Message x Sex	1	.13
Condition x Message x Sex	1	.83
Order x Message x Sex	1	.32
Condition x Order x Message x Sex	0	.
Channel x Message x Sex	1	.01
Condition x Channel x Message x Sex	0	.
Order x Channel x Message x Sex	0	.
Condition x Order x Channel x Message x Sex	0	.
Error	81	
Total	112	
Corrected Total	111	

** $p < .01$ *** $p < .001$

In the fourth ANOVA, Condition (word vs. prose), Order (first vs. second), Channel (right vs. left), Message (1 vs. 2), and Sex were entered as fixed factors. The percentage of low-association words remembered from the unshadowed ear was entered as the dependent variable. To control for the tendency to over-report, the percentage of words recognized from the control words (that were in neither message) was entered as the covariate. The effect for condition was not significant. To view the ANOVA, refer to Table 21.

Table 21. A Comparison of Memory for Low-association Words Presented to the Unshadowed Channel Across the Word List and Prose Conditions

Source	df	F
Corrected Model	30	2.82***
Intercept	1	9.28**
Percent Control Words	1	21.66**
Condition	1	1.26
Order	1	.57
Channel	1	.16
Message	1	7.11**
Sex	1	1.64
Condition x Order	1	2.29
Condition x Channel	1	.41
Order x Channel	1	1.01
Condition x Order x Channel	1	.04
Condition x Message	1	4.39*
Order x Message	1	.45
Condition x Order x Message	1	1.70
Channel x Message	1	.03
Condition x Channel x Message	1	.73
Order x Channel x Message	1	.589
Condition x Order x Channel x Message	1	.32
Condition x Sex	1	.00

Table 21. Continued

Order x Sex	1	.03
Condition x Order x Sex	1	.47
Channel x Sex	1	.32
Condition x Channel x Sex	1	.87
Order x Channel x Sex	1	.05
Condition x Order x Channel x Sex	0	.
Message x Sex	1	1.01
Condition x Message x Sex	1	.02
Order x Message x Sex	1	.60
Condition x Order x Message x Sex	0	.
Channel x Message x Sex	1	.23
Condition x Channel x Message x Sex	0	.
Order x Channel x Message x Sex	0	.
Condition x Order x Channel x Message x Sex	0	.
Error	81	
Total	112	
Corrected Total	111	

* $p < .05$ ** $p < .01$ *** $p < .001$

Because with the exception of memory for low-association words, recall was better for words presented in the prose condition, word list and prose data should be analyzed separately for those conditions.

Word List Task

Psychometric Assessments

The average score on the Alternate Uses Test was 30.58 (SD = 8.51). The average score on the Remote Associates Test was 8.76 (SD = 4.03). The average score on the Creative Personality Scale was 5.03 (SD = 3.65). Every participant's scores on the three potential creativity measures were standardized and added to form a composite creativity measure, hereafter referred to as "Creativity" (M = 0, SD = 1.92). There were no gender differences in scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, or Creativity. The average score on the Wechsler Abbreviated Scale of Intelligence-Verbal was 109.04 (SD = 10.54). The average score on the Wechsler Abbreviated Scale of Intelligence-Performance was 108.80 (SD = 10.80). The average score on the Wechsler Abbreviated Scale of Intelligence-Full was 109.85 (SD = 10.38). There were no gender differences on any of the IQ measures. The average score on Extraversion was 15.44 (SD = 5.45). The average score on Neuroticism was 12.13 (SD = 5.39). The average score on Psychoticism was 7.69 (SD = 4.03). The average score for the Lie Scale was 5.89 (SD = 3.37). There were no gender differences in scores on Extraversion, Neuroticism, or the Lie Scale, but males (M = 9.61, SD = 3.90) scored significantly higher than females (M = 6.37, SD = 3.61) on Psychoticism, t (69) = 3.58, $p < .001$. This difference is in accord with reported norms (see Eysenck &

Eysenck, 1994). For the correlation matrices including the psychometric, creativity, and intelligence measures, refer to tables 22 and 23.

Table 22. Correlation Matrix for Potential Creativity and Intelligence Measures on the Word List Task

	AUT	RAT	CPS	Creativity	Verbal IQ	Performance IQ	Full scale IQ
AUT							
RAT	.07						
CPS	.11	.09					
Creativity	.63**	.63**	.64**				
Verbal IQ	.19	.20	.09	.25			
Performance IQ	.05	.18	.07	.17	.47**		
Full scale IQ	.15	.27*	.10	.29*	.85**	.85**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale.

* $p < .05$. ** $p < .01$.

Table 23. Correlation Matrix for Potential Creativity and Personality Measures on the Word List Task

	AUT	RAT	CPS	Creativity	E	N	P	L
AUT								
RAT	.07							
CPS	.11	.09						
Creativity	.63**	.63**	.64**					
E	.17	.01	.47**	.51**				
N	-.18	-.03	-.19*	-.22*	-.27*			
P	.07	.19	.19	.18	.10	.07		
L	-.03	-.22	-.02	0	.02	-.30*	-.48**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale; E = Extraversion; N = Neuroticism; P = Psychoticism; L = Lie Scale.

* $p < .05$. ** $p < .01$.

Note the significant correlation between Full-scale IQ and Creativity, r (50) = .29, $p < .05$. Also note the significant correlation between Extraversion and scores on the Creative Personality Scale, r (71) = .51, $p < .001$, and the significant correlation between Extraversion and Creativity, r (70) = .35, $p < .01$. Reports of a positive correlation between Extraversion and Creativity are common, and have been reported elsewhere (e.g., Eysenck, 1995; Martindale & Dailey, 1996).

Memory Performance

This task contained four dependent variables: Percentage of words recognized from the shadowed ear, percentage of words recognized from the unshadowed ear, percentage of high-association words recognized from the unshadowed ear, and percentage of low-association words recognized from the unshadowed ear. For each dependent variable, four ANOVAs were conducted to investigate the effect of each potential creativity measure on performance.

Regarding memory for the percentage of words from the shadowed ear, the first ANOVA involved Order (first task vs. second task), Channel (left vs. right), Message (1 vs. 2), Sex, and dichotomized scores on the Creative Personality Scale (above vs. below the median) as fixed factors, and Full-scale IQ scores, Extraversion, and percentage of control words as covariates. The relationship between scores on the Creative Personality Scale and performance was significant, $F(1, 17) = 4.48$, $p < .05$. Participants with higher scores on the Creative Personality Scale recalled a higher percentage of words from the shadowed message ($M = 43.04$, $SE = 3.54$) compared to those with lower scores ($M = 31.48$, $SE = 3.70$). To view this ANOVA, refer to Table 24. This factorial ANOVA was repeated four more times with the dichotomized scores on the Alternate Uses Test, the Remote Associates Test, Creativity, and Psychoticism as the potential creativity variable of interest in each case respectively. The effect for none of the other potential creativity measures reached significance.

Table 24. The Relationship Between Scores on the Creative Personality Scale and Memory for Words Presented to the Shadowed Ear in the Word List condition

Source	df	F	Eta Squared
Corrected Model	22	2.54*	.77
Intercept	1	.25	.02
Full-scale IQ	1	2.00	.11
Extraversion	1	.05	.00
Control words	1	9.91**	.37
Sex	1	2.55	.12
Order	1	2.08	.10
Channel	1	.03	.00
Message	1	3.62	.18
Creative Personality Scale	1	4.48*	.21
Sex x Order	1	.65	.04
Sex x Channel	1	3.98	.18
Order x Channel	1	.10	.01
Sex x Order x Channel	1	.52	.02
Sex x Message	1	.76	.03
Order x Message	1	.00	.00
Sex x Order x Message	0	.	.00
Channel x Message	0	.	.00
Sex x Channel x Message	0	.	.00
Order x Channel x Message	0	.	.00
Sex x Order x Channel x Message	0	.	.00
Sex x Creative Personality Scale	1	.86	.05
Order x Creative Personality Scale	1	.00	.00
Sex x Order x Creative Personality Scale	0	.	.00

Table 24. Continued

Channel x Creative Personality Scale	0	.	.00
Sex x Channel x Creative Personality Scale	0	.	.00
Order x Channel x Creative Personality Scale	0	.	.00
Sex x Order x Channel x Creative Personality Scale	0	.	.00
Message x Creative Personality Scale	1	1.87	.09
Sex x Message x Creative Personality Scale	0	.	.00
Order x Message x Creative Personality Scale	0	.	.00
Sex x Order x Message x Creative Personality Scale	0	.	.00
Channel x Message x Creative Personality Scale	0	.	.00
Sex x Channel x Message x Creative Personality Scale	0	.	.00
Order x Channel x Message x Creative Personality Scale	0	.	.00
Sex x Order x Channel x Message x Creative Personality Scale	0	.	.00
Error	17		
Total	40		
Corrected Total	39		

* $p < .05$ ** $p < .01$.

Regarding memory for percentage of words from the unshadowed ear, five ANOVAs were conducted to investigate the effects of the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, Creativity, and Psychoticism on performance respectively. Potential creativity and Psychoticism scores were dichotomized using median splits. Apart from the dichotomized potential creativity measure of interest, each ANOVA included Order (first task vs. second task), Channel (left vs. right), Message (1 vs. 2), and Sex as fixed factors, and Full-scale IQ scores, Extraversion, and percentage of control words as covariates. The effect for none of the potential creativity measures reached significance.

Regarding memory for high-association words from the unshadowed ear, five ANOVAs were conducted to investigate the effects of the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, Creativity, and Psychoticism on performance respectively. Potential creativity and Psychoticism scores were dichotomized using median splits. Apart from the dichotomized potential creativity measure of interest, each ANOVA included Order (first vs. second), Channel (left vs. right), Message (1 vs. 2), and Sex as fixed factors, and Full-scale IQ scores, Extraversion, and percentage of control words as covariates. The relationship between scores on the Remote Associates Test and performance was significant, $F(1, 16) = 7.71, p < .05$. Participants with higher scores on the Creative Personality Scale recalled a higher percentage of words from the shadowed message ($M = 23.22$, $SE = 4.00$) compared to those with lower scores ($M = 12.35$, $SE = 3.83$). To view this ANOVA refer to Table 25. The effect for none of the other potential creativity measures reached significance.

Table 25. The Relationship Between Scores on the Remote Associates Test and Memory for Low-association Words

Source	df	F	Eta Squared
Corrected Model	22	3.93**	.83
Intercept	1	.14	.01
Full-scale IQ	1	.07	.00
Extraversion	1	5.32*	.25
Control words	1	52.27***	.77
Sex	1	7.18*	.30
Order	1	.23	.02
Channel	1	.96	.06
Message	1	2.72	.15
Remote Associates Test	1	7.71*	.33
Sex x Order	1	.45	.03
Sex x Channel	0	6.75*	.28
Order x Channel	1	.00	.00
Sex x Order x Channel	0		.00
Sex x Message	1	.04	.00
Order x Message	1	.12	.01
Sex x Order x Message	0	.	.00
Channel x Message	0	.	.00
Sex x Channel x Message	0	.	.00
Order x Channel x Message	0	.	.00
Sex x Order x Channel x Message	0	.	.00
Sex x Remote Associates Test	1	1.74	.08
Order x Remote Associates Test	0		.00
Sex x Order x Remote Associates Test	0	.	.00

Table 25. Continued

Channel x Remote Associates Test	0	.	.00
Sex x Channel x Remote Associates Test	0	.	.00
Order x Channel x Remote Associates Test	0	.	.00
Sex x Order x Channel x Remote Associates Test	0	.	.00
Message x Remote Associates Test	1	3.38	.16
Sex x Message x Remote Associates Test	0	.	.00
Order x Message x Remote Associates Test	0	.	.00
Sex x Order x Message x Remote Associates Test	0	.	.00
Channel x Message x Remote Associates Test	0	.	.00
Sex x Channel x Message x Remote Associates Test	0	.	.00
Order x Channel x Message x Remote Associates Test	0	.	.00
Sex x Order x Channel x Message x Remote Associates Test	0	.	.00
Error	16		
Total	39		
Corrected Total	38		

$^{*}p < .05$ $^{**}p < .01$.

Because a preliminary ANOVA had not shown that condition (word vs. prose) had an effect on memory for low-association words from the unshadowed ear (see above), the data were collapsed across conditions for this analysis. Apart from the dichotomized potential creativity measure of interest, each ANOVA involved Order (first vs. second), Channel (left vs. right), Message (1 vs. 2), and Sex as fixed factors, and Full-scale IQ scores, Extraversion, and number of control words as covariates. The effect for none of the potential creativity factors reached significance.

Prose Task

Psychometric Assessments

The average score on the Alternate Uses Test was 30.38 (*SD* = 8.51). The average score on the Remote Associates Test was 8.74 (*SD* = 3.96). The average score on the Creative Personality Scale was 5.14 (*SD* = 3.62). Every participant's scores on the three potential creativity measures were standardized and added to form a composite creativity measure, hereafter referred to as "Creativity" (*M* = 0, *SD* = 1.90). There were no gender differences in scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, or Creativity. The average score on the Wechsler Abbreviated Scale of Intelligence-Verbal was 109.04 (*SD* = 10.41). The average score on the Wechsler Abbreviated Scale of Intelligence-Performance was 108.67 (*SD* = 10.61). The average score on the Wechsler Abbreviated Scale of Intelligence-Full was 109.82 (*SD* = 10.23). There were no gender differences on any of the IQ measures. The average score on Extraversion was 15.46 (*SD* = 5.36). The average score on Neuroticism was 12.11 (*SD* = 5.42). The average score on Psychoticism was 7.69 (*SD* = 4.01). There were no gender differences in scores on Extraversion or Neuroticism, but males (*M* = 9.39, *SD* = 4.02) scored significantly higher than females (*M* = 6.51, *SD* = 3.59) on Psychoticism, $t\ (72) = 3.21, p < .01$. This difference is in accord with reported norms (see Eysenck & Eysenck, 1994).

For the correlation matrix including the psychometric, creativity, and intelligence measures refer to tables 26 and 27. Note the significant correlation between Full-scale IQ and scores on the Remote Associates Test, $r\ (53) = .26, p < .05$, and the significant correlation between Full-scale IQ and Creativity, $r\ (53) = .30, p < .05$. Also note the significant correlation between Extraversion and scores on the Creative Personality Scale, $r\ (74) = .52, p < .001$, and the significant correlation between Extraversion and Creativity, $r\ (73) = .33, p < .01$. Finally, note the significant negative correlation between Neuroticism and scores on the Creative Personality Scale, $r\ (74) = -.24, p < .05$, and the significant negative correlation between Neuroticism and Creativity, $r\ (73) = -.22, p < .05$. Reports of positive correlations between Extraversion and Creativity, as well as negative correlations between Neuroticism and Creativity, are common and have been reported elsewhere (e.g., Eysenck, 1995; Martindale & Dailey, 1996).

Table 26. Correlation Matrix for Potential Creativity and Intelligence Measures on the Prose Task

	AUT	RAT	CPS	Creativity	Verbal IQ	Performance IQ	Full scale IQ
AUT							
RAT	.10						
CPS	.10	.09					
Creativity	.62**	.63**	.62**				
Verbal IQ	.20	.20	.09	.27			
Performance IQ	.08	.19	.07	.17	.46**		
Full scale IQ	.17	.26*	.11	.30*	.84**	.85**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale.

* $p < .05$. ** $p < .01$.

Table 27. Correlation Matrix for Potential Creativity and Personality Measures on the Prose Task

	AUT	RAT	CPS	Creativity	E	N	P	L
AUT								
RAT	.10							
CPS	.10	.09						
Creativity	.62**	.63**	.62**					
E	.15	0	.52**	.33**				
N	-.17	-.03	-.24*	-.22*	-.28*			
P	-.05	.20	.17	.17	.06	.10		
L	0	-.23	-.01	-.10	.04	-.27*	-.47**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale; E = Extraversion; N = Neuroticism; P = Psychoticism; L = Lie Scale.

* $p < .05$. ** $p < .01$.

Memory Performance

This task contained four dependent variables: Percentage of words recognized from the shadowed ear, percentage of words recognized from the unshadowed ear, the percentage of high-association words recognized from the unshadowed ear, and the percentage of low-association words recognized from the unshadowed ear. Apart from testing for the percentage of low-association words recognized from the unshadowed, five ANOVAs were conducted to investigate the effect of each potential creativity measure and Psychoticism on performance.

Regarding memory for percentage of words from the shadowed ear, apart from the dichotomized potential creativity measure of interest, each ANOVA involved Order (first vs. second), Channel (left vs. right), Message (1 vs. 2), and Sex as fixed factors, and Full-scale IQ, Extraversion, Neuroticism, and percentage of control words as covariates (see above). The effect for none of the potential creativity measures reached significance.

Regarding memory for percentage of words from the unshadowed ear, apart from the dichotomized potential creativity measure of interest, each ANOVA involved Order (first vs. second), Channel (left vs. right), Message (1 vs. 2), and Sex as fixed factors, and Full-scale IQ, Extraversion, Neuroticism, and percentage of control words as covariates (see above). The effect for none of the potential creativity measures reached significance.

Regarding memory for percentage of high-association words from the shadowed ear, apart from the dichotomized potential creativity measure of interest, each ANOVA involved Order (first vs. second), Channel (left vs. right), Message (1 vs. 2), and Sex as fixed factors, and Full-scale IQ, Extraversion, Neuroticism, and percentage of control words as covariates (see above). The effect for none of the potential creativity measures reached significance.

Discussion

The results demonstrated that participants had better memory for words that were presented in passages of prose than they did for words that were inserted in word lists. Participants who had higher scores on the Creative Personality Scale had better memory for words that were presented to the shadowed channel. This finding replicated

Rawlings' (1985) results in the focused attention condition, where it was found that when creative people are provided with cues to focus attention, they are capable of doing so successfully. The finding also supports Martindale's (1999) theory, according to which creative people can focus their attention successfully depending on situational demands. However, the above must not be generalized to the performance of creative people in focused attention paradigms because the superior ability of creative participants to focus attention on the contents of the shadowed message was evident in one of eight comparison conditions only.

In addition, it was also found that participants who had higher scores on the Remote Associates Test had better memory for high-association words that were presented to the unshadowed channel. This finding was a replication of Dykes and McGhie's (1976) results, where it was found that creative people switched from the attended to the unattended message only when the experimental conditions were most conducive to doing so: In the word list condition, and when the association between the pair of words in the two channels was high. Thus, the results of the current study demonstrate that when given a cue (e.g., instructions) to attend to the contents of one channel, those with higher scores on the Creative Personality Scale can do so more successfully compared to those with lower scores. In addition, those with higher scores on the Remote Associates Test tend to switch to the unshadowed message only when the experimental conditions are conducive to doing so. Taken together, these findings do not support the contention that creative people have an indiscriminate tendency to sample environmental stimuli. The results indicate that to the extent that the Creative Personality Scale and the Remote Associates Test can be viewed as measures of potential creativity, one can argue that creative people are capable of focusing their attention unless the conditions provide

Color Tasks

On each trial of the Red-Yellow color task, participants were presented with a color that would be selected from the red-yellow range, and asked to determine whether the stimulus was red or yellow. The experimenter in turn varied the ambiguity of the stimuli by selecting colors that were unambiguously red or yellow, but also several that would be characterized more correctly as orange. Based on the findings of Kwiatkowski, Vartanian, and Martindale (1999), it was hypothesized that creative participants would be slower in interpreting colors as red or yellow if they were selected from the ambiguous orange range. To determine whether complexity would have an effect on processing speed, on some trials the presentation of the color would be coupled with the presentation of a tone, to which participant was instructed to respond to as quickly as possible by pressing a button. Thus, in line with previous research, complexity was interpreted in terms of increasing cognitive load, primarily on attention (Besner et al., 1981). In the Blue-Green color task, the same procedure was repeated for colors in the blue-green range.

Method

Participants

Seventy-three right-handed undergraduates enrolled in University of Maine psychology classes volunteered to take part in this experiment. Prior to conducting the color tasks, participants were tested for color blindness using the standard Ishihara plates. One male participant was found to be color blind, and therefore did not take part in either color task. Seventy-two (27 males, 45 females) participants completed the color tasks. The average age of the sample was 20.3 years (*SD* = 2.4).

The order in which the Red-Yellow and Blue-Green tasks were administered was randomized for each participant.

Materials

Red-Yellow Task

Twenty-two colors in the Red-Yellow range were selected from the available selection in Photoshop (Version 6.0.1, Adobe, 2001). The default settings of the colors were not altered. Colors in Photoshop are created based on two different pigment generation techniques: The relatively well-known "RGB" model, whereby an additive process of mixing the primary colors red, green, and blue is used to generate color, and the lesser known "CMYK" model. The following description of the CMYK model is reproduced from the Photoshop Help menu:

> The CMYK model is based on the light-absorbing quality of ink printed on paper. As white light strikes translucent inks, part of the spectrum is absorbed and part is reflected back to your eyes. In theory, pure cyan (C), magenta (M), and yellow (Y) pigments should combine to absorb all color and produce black. For this reason these colors are called *subtractive* colors. Because all printing inks contain some impurities, these three inks actually produce a muddy brown and must be combined with black (K) ink to produce a true black. (*K* is used instead of B to avoid confusion with blue.) Combining these inks to reproduce color is called *four-color process printing*. The subtractive (CMY) and additive (RGB) colors are

complementary colors. Each pair of subtractive colors creates an additive color, and vice versa.

In addition, Photoshop uses a unique method to generate colors on the screen using pixels in the CMYK mode. To illustrate this point, the following excerpt is reproduced from the Photoshop Help menu:

> In Photoshop's CMYK mode, each pixel is assigned a percentage value for each of the process inks. The lightest (highlight) colors are assigned small percentages of process ink colors, the darker (shadow) colors higher percentages. For example, a bright red might contain 2% cyan, 93% magenta, 90% yellow, and 0% black. In CMYK images, pure white is generated when all four components have values of 0%.

The 22 colors that were chosen consisted of RGB red, RGB yellow, and twenty colors in the red and yellow range that are generated using various combinations of inks in the CMYK mode. The RGB red and RGB yellow were included because along with CMYK red and CMYK yellow, they represent the most unambiguous examples of red and yellow respectively. Each color was saved as a separate Paint file.

Two wave files were prepared: One was a mono, 8-Bit tone, with duration of 0.250 s. It was a recording of the standard US dial tone, with frequencies of 350 Hz and 440 Hz. The other was a silent tone.

Procedure

The computer program E-prime (Psychology Software Tools, 2000) was used to run the experiment. The stimuli were square shaped, and the length of each side was approximately 5 inches. The stimuli were presented on a 14-inch Trinitron Sony monitor, at a visual angle of 12.3 degrees. After the participant was seated in front of the computer, the experimenter explained that each trial of this experiment consisted of the presentation a patch of color on the screen, and that the participant was required to determine its color by pressing "1" for red and "2" for yellow. It was also explained that whereas some of the stimuli appeared unambiguously red or yellow, others might be a little more difficult to categorize. Nevertheless, the determination of the color in terms of the red-yellow distinction had to be made.

The participants were then informed that they would be supplied with stereo headphones prior to the start of the task, and that on some random trials a tone would be generated simultaneously with the presentation of the color on the screen. Upon hearing the tone, participants were instructed to press the "X" button as quickly as possible, and then to proceed with the color determination task. When the participant indicated a clear understanding of the instructions, he or she was equipped with a set of headphones, and the computer task was begun. The following instruction was the first to appear on the screen:

> On each trial of the first part of this experiment, you will be presented with a color stimulus which is either RED or YELLOW. Your task is to determine the color of the stimulus, by pressing "1" if you think it is red, and "2" if you think it is yellow.

The next set of instructions read:

> On SOME of the trials, you will be presented with a brief tone of sound. Your job is to press the "x" button on the keyboard as soon as you detect it. Remember, the tone will NOT accompany every trial!

Each experimental session consisted of 22 trials. Prior to the experimental sessions the participants completed eight practice trials where a selection of eight colors were presented randomly on the screen. The eight colors were RGB Red, CMYK Red, RGB Yellow, CMYK Yellow, Dark Red Orange, Pastel Red Orange, Dark Yellow Orange, and Pastel Yellow Orange. They received feedback regarding the accuracy of their color judgments on each trial. The feedback was based on the following criterion: They received "Correct" feedback if they identified the RGB red, CMYK Red, Dark Red Orange, and Pastel Red Orange as red, and RGB Yellow, CMYK Yellow, Dark Yellow Orange, and Pastel Yellow Orange as yellow.

Blue-Green Task

Twenty-two colors in the Blue-Green range were selected from the available selection in Photoshop (Version 6.0.1, Adobe, 2001). The default settings of the colors were not altered. As noted earlier, the colors in Photoshop are created based on two different pigment generation techniques: The relatively well-known "RGB" model, whereby an additive process of mixing the primary colors red, green, and blue is used to generate color, and the lesser known "CMYK" model. For a detailed description of the CMYK model refer to the *Materials* section of the Red-Yellow task. The 22 colors that were chosen consisted of RGB blue, RGB green, and 20 colors in the blue and green range that are generated using various combinations of inks in the CMYK mode. The RGB blue and RGB green were included because along with CMYK blue and CMYK green, they represent the most unambiguous examples of blue and green. Each color was saved as a separate Paint file.

The same two wave files were used in the Red-Yellow Task were used in the Blue-Green Task.

Procedure

Apart from instructing the participants to press "1" upon the detection of blue and "2" upon the detection of green, the procedure that was carried out for this task was identical to the one employed for the Red-Yellow task. The colors that were used in the practice trials were the following: RGB Blue, CMYK Blue, RGB Green, CMYK Green, Light Cyan Blue, Pastel Cyan Blue, Light Green Cyan, and Pure Green Cyan. The feedback was based on the following criterion: They received "Correct" feedback if they identified the RGB Blue, CMYK Blue, Light Cyan Blue, and Pastel Cyan Blue as blue, and RGB Green, CMYK Green, Light Green Cyan, and Pure Green Cyan as green.

Results

Psychometric Assessments

The average score on the Alternate Uses Test was 31.28 (*SD* = 8.90). The average score on the Remote Associates Test was 8.69 (*SD* = 3.84). The average score on the Creative Personality Scale was 5.38 (*SD* = 3.49). Every participant's scores on the three potential creativity measures were standardized and added to form a composite creativity measure, hereafter referred to as "Creativity" (*M* = 0, *SD* = 1.89). There were no gender differences in scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, or the composite Creativity measure. The average score on the Wechsler Abbreviated Scale of Intelligence-Verbal was 108.64 (*SD* = 10.83). The average score on the Wechsler Abbreviated Scale of Intelligence-Performance was 108.19 (*SD* = 10.71). The average score on the Wechsler Abbreviated Scale of

Intelligence-Full was 109.35 (*SD* = 10.46). There were no gender differences on any of the IQ measures. The average score on Extraversion was 15.85 (*SD* = 5.11). The average score on Neuroticism was 11.92 (*SD* = 5.49). The average score on Psychoticism was 7.60 (*SD* = 3.93). The average score on the Lie Scale was 5.82 (*SD* = 3.29). There were no gender differences in scores on Extraversion, Neuroticism, or the Lie Scale, but males ($M = 9.41$, $SD = 4.11$) scored significantly higher than females ($M = 6.50$, $SD = 3.46$) on Psychoticism, $t\ (70) = 3.21, p < .01$. This difference is in accord with reported norms (see Eysenck & Eysenck, 1994).

For the correlation matrices including the above psychometric, creativity, and intelligence measures, refer to tables 28 and 29. Note the significant correlation between Full-scale IQ and scores on the Remote Associates Test, $r\ (51) = .30, p < .05$, and the significant correlation between Full-scale IQ and Creativity, $r\ (51) = .36, p < .05$. Also note the significant correlation between Extraversion and scores on the Creative Personality Scale, $r\ (72) = .52, p < .001$, and the significant correlation between Extraversion and Creativity, $r\ (71) = .29, p < .05$. Finally, note the significant correlation between Psychoticism and scores on the Remote Associates Test, $r\ (71) = .25, p < .05$, the significant correlation between Psychoticism and scores on the Creative Personality Scale, $r\ (72) = .24, p < .05$, and the significant correlation between Psychoticism and Creativity, $r\ (71) = .26, p < .05$. Reports of positive correlations between Extraversion and Creativity, as well as positive correlations between Psychoticism and Creativity, are common and have been reported elsewhere (e.g., Eysenck, 1995; Martindale & Dailey, 1996).

Table 28. Correlation Matrix for Potential Creativity and Intelligence Measures on Color Tasks

	AUT	RAT	CPS	Creativity	Verbal IQ	Performance IQ	Full scale IQ
AUT							
RAT	.03						
CPS	.13	.07					
Creativity	.62**	.60**	.65**				
Verbal IQ	.17	.22	.09	.28*			
Performance IQ	.13	.20	.18	.27	.46**		
Full scale IQ	.17	.28*	.18	.36**	.84**	.86**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale.

* $p < .05$. ** $p < .01$.

Table 29. Correlation Matrix for Potential Creativity and Personality Measures on Color Tasks

	AUT	RAT	CPS	Creativity	E	N	P	L
AUT								
RAT	.03							
CPS	.13	.07						
Creativity	.62**	.60**	.65**					
E	.09	-.04	.45**	.27*				
N	-.11	-.01	-.16	-.17*	-.24*			
P	-.02	.25*	.24*	.26*	.02	.12		
L	-.07	-.19	.02	-.13	.01	-.33**	-.58**	

Note. AUT = Alternate Uses Test; RAT = Remote Associates Test; CPS = Creative Personality Scale; E = Extraversion; N = Neuroticism; P = Psychoticism; L = Lie Scale.
* $p < .05$. ** $p < .01$.

Computer Tasks

Each participant determined the color of 22 different color stimuli. For stimuli in the Red-Yellow experiment, four stimuli were categorized as unambiguous: RGB red, RGB yellow, CMYK red, and CMYK yellow. The other eighteen stimuli were categorized as ambiguous. For stimuli in the Blue-Green experiment, four stimuli were categorized as unambiguous: RGB blue, RGB green, CMYK blue, and CMYK green. The other eighteen stimuli were categorized as ambiguous. Across Red-Yellow and Blue-Green tasks, 89% of color judgments were correct. All analyses that are reported in this section are based on correct color judgments only. The decision *not* to use incorrect judgments was made to eliminate the problems associated with interpreting results based on incorrect responses. For example, incorrect judgments can occur for a number of reasons, such as an inability to discover the categorization rule, low vigilance, misuse of equipment, etc. Therefore, compared to correct responses, it is more difficult to isolate the theoretical mechanisms that are hypothesized to underlie the observed effects associated with incorrect responses.

A factorial ANOVA was conducted with reaction time in making color judgment as dependent variable, and Task (Red-Yellow vs. Blue-Green), Order of administration (first vs. second), Sex, and Ambiguity (ambiguous vs. unambiguous) and Sound (presence vs. absence) as fixed factors. The results revealed that females ($M = 874.62$, $SE = 23.11$) had faster reaction times than males ($M = 974.354$, $SE = 24.54$), $F(1, 360) = 8.75$, $p < .01$. The results also indicated that participants were faster in identifying unambiguous colors ($M = 775.96$, $SE = 23.83$) than they were in identifying ambiguous colors ($M = 1073.03$, $SE = 23.83$), $F(1, 360) = 77.63$, $p < .001$. Finally, color identification was slower on trials when it was coupled with the tone of sound ($M = 1036.41$, $SE = 23.83$), than when it was not ($M = 812.58$, $SE = 23.83$), $F(1, 360) = 44.06$, $p < .001$. To view this ANOVA refer to Table 30. Because of the sex difference, the analyses involving potential creativity measures were conducted separately for each sex.

Table 30. A Comparison of Reaction Time Latencies for the Blue-Green and the Red-Yellow Color Tasks

Source	df	F	Partial Eta Squared
Corrected Model	31	5.23***	.31
Intercept	1	3007.37***	.88
Task	1	3.74	.01
Order	1	.00	.00
Sex	1	8.75**	.01
Ambiguity	1	77.62***	.18
Sound	1	44.06***	.11
Task x Order	1	.17	.00
Task x Sex	1	.25	.00
Order x Sex	1	.12	.00
Task x Order x Sex	1	2.52	.01
Task x Ambiguity	1	8.82**	.01
Order x Ambiguity	1	.10	.00
Task x Order x Ambiguity	1	.25	.00
Sex x Ambiguity	1	.04	.00
Task x Sex x Ambiguity	1	.18	.00
Order x Sex x Ambiguity	1	.05	.00
Task x Order x Sex x Ambiguity	1	.03	.00
Task x Sound	1	.30	.00
Order x Sound	1	.32	.00

Table 30. Continued

Task x Order x Sound	1	.86	.00
Sex x Sound	1	.40	.00
Task x Sex x Sound	1	.00	.00
Order x Sex x Sound	1	.87	.00
Task x Order x Sex x Sound	1	1.40	.00
Ambiguity x Sound	1	7.30**	.01
Task x Ambiguity x Sound	1	1.18	.00
Order x Ambiguity x Sound	1	.05	.00
Task x Order x Ambiguity x Sound	1	.10	.00
Sex x Ambiguity x Sound	1	.00	.00
Task x Sex x Ambiguity x Sound	1	.14	.00
Order x Sex x Ambiguity x Sound	1	.14	.00
Task x Order x Sex x Ambiguity x Sound	1	.52	.00
Error	360		
Total	392		
Corrected Total	391		

** $p < .01$ *** $p < .001$

Males

Four factorial ANOVA's were conducted to investigate the effect of scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, and Creativity on color judgment reaction time. Scores on all four creativity measures were dichotomized using a median split. The first factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and scores on the Alternate Uses Test (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed those who scored higher on the Alternate Uses Test had significantly faster ($M = 864.62$, $SE = 40.80$) reaction times than those who scored lower ($M = 1051.90$, $SE = 40.83$), $F(1, 109) = 10.43$, $p < .01$. The results also revealed significant effects for Ambiguity, $F(1, 109) = 28.68$, $p < .001$, and Sound, $F(1, 109) = 29.07$, $p < .001$. To view this ANOVA, refer to Table 31.

Table 31. The Relationship Between Scores on the Alternate Uses Test and Performance on Color Tasks in Males

Source	df	F	Partial Eta Squared
Corrected Model	34	3.24***	.50
Intercept	1	.83	.01
Full-Scale IQ	1	.86	.01
Extraversion	1	14.96***	.11
Psychoticism	1	.45	.00
Task	1	1.33	.01
Order	1	.00	.00
Ambiguity	1	28.68***	.21
Sound	1	29.07***	.20
Alternate Uses Test	1	10.43**	.09
Task x Order	1	.05	.00
Task x Ambiguity	1	3.84	.02
Order x Ambiguity	1	.18	.00
Task x Order x Ambiguity	1	1.90	.02
Task x Sound	1	.10	.00
Order x Sound	1	1.33	.00
Task x Order x Sound	1	1.95	.02
Ambiguity x Sound	1	3.84	.02
Task x Ambiguity x Sound	1	1.62	.02
Order x Ambiguity x Sound	1	.00	.00
Task x Order x Ambiguity x Sound	1	.50	.01
Task x Alternate Uses Test	1	.40	.00
Order x Alternate Uses Test	1	.00	.00
Task x Order x Alternate Uses Test	1	2.66	.01

Table 31. Continued

Ambiguity x Alternate Uses Test	1	.17	.00
Task x Ambiguity x Alternate Uses Test	1	.00	.00
Order x Ambiguity x Alternate Uses Test	1	.01	.00
Task x Order x Ambiguity x Alternate Uses Test	1	1.11	.00
Alternate Uses Test x Sound	1	.02	.00
Task x Alternate Uses Test x Sound	1	.03	.00
Order x Alternate Uses Test x Sound	1	.25	.00
Task x Order x Alternate Uses Test x Sound	1	1.87	.02
Ambiguity x Alternate Uses Test x Sound	1	.12	.00
Task x Ambiguity x Alternate Uses Test x Sound	1	1.72	.02
Order x Ambiguity x Alternate Uses Test x Sound	1	.10	.00
Task x Order x Ambiguity x Alternate Uses Test x Sound	1	.00	.00
Error	109		
Total	144		
Corrected Total	143		

** $p < .05$ *** $p < .001$.

The second factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and scores on the Remote Associates Test (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed that those who scored higher on the Remote Associates Test had significantly faster reaction times (M = 868.60, SE = 40.84) than those who scored lower (M = 1122.16, SE = 50.23), F (1, 101) = 12.81, $p < .01$. The results also revealed significant effects for Ambiguity, F (1, 101) = 25.24, $p < .001$, and Sound, F (1, 101) = 30.73, $p < .001$. To view this ANOVA, refer to Table 32.

Table 32. The Relationship Between Scores on the Remote Associates Test and Performance on Color Tasks in Males

Source	df	F	Partial Eta Squared
Corrected Model	34	3.89***	.57
Intercept	1	3.03	.03
Full-scale IQ	1	.22	.00
Extraversion	1	25.33***	.20
Psychoticism	1	3.03	.03
Task	1	2.04	.01
Order	1	.04	.00
Ambiguity	1	25.24***	.20
Sound	1	30.73***	.22
Remote Associates Test	1	12.81**	.10
Task x Order	1	4.27*	.03
Task x Ambiguity	1	4.95*	.05
Order x Ambiguity	1	.03	.00
Task x Order x Ambiguity	1	2.96	.03
Task x Sound	1	.05	.00
Order x Sound	1	1.55	.02
Task x Order x Sound	1	2.38	.01
Ambiguity x Sound	1	2.56	.03
Task x Ambiguity x Sound	1	3.76	.04
Order x Ambiguity x Sound	1	.44	.00
Task x Order x Ambiguity x Sound	1	1.15	.01
Task x Remote Associates Test	1	.01	.00
Order x Remote Associates Test	1	.93	.01
Task x Order x Remote Associates Test	1	14.73	.13

Table 32. Continued

Ambiguity x Remote Associates Test	1	1.30	.00
Task x Ambiguity x Remote Associates Test	1	1.17	.00
Order x Ambiguity x Remote Associates Test	1	.00	.00
Task x Order x Ambiguity x Remote Associates Test	1	.00	.00
Remote Associates Test x Sound	1	1.24	.00
Task x Remote Associates Test x Sound	1	.07	.00
Order x Remote Associates Test x Sound	1	.13	.00
Task x Order x Remote Associates Test x Sound	1	.43	.00
Ambiguity x Remote Associates Test x Sound	1	.00	.00
Task x Ambiguity x Remote Associates Test x Sound	1	.64	.01
Order x Ambiguity x Remote Associates Test x Sound	1	1.56	.02
Task x Order x Ambiguity x Remote Associates Test x Sound	1	1.71	.02
Error	101		
Total	136		
Corrected Total	135		

* $p < .05$ ** $p < .01$ *** $p < .001$.

The third factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and scores on the Creative Personality Scale (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed significant effects for Ambiguity, $F(1, 109) = 26.36$, $p < .001$, and Sound, $F(1, 109) = 27.92$, $p < .001$. To view this ANOVA, refer to Table 33.

Table 33. The Relationship Between Scores on the Creative Personality Scale and Performance on Color Tasks in Males

Source	df	F	Partial Eta Squared
Corrected Model	34	2.70***	.46
Intercept	1	.75	.01
Full-scale IQ	1	.61	.01
Extraversion	1	12.27**	.10
Psychoticism	1	.12	.00
Task	1	1.92	.02
Order	1	.04	.00
Ambiguity	1	26.36***	.20
Sound	1	27.92***	.20
Creative Personality Scale	1	.40	.00
Task x Order	1	.02	.00
Task x Ambiguity	1	3.37	.02
Order x Ambiguity	1	.25	.00
Task x Order x Ambiguity	1	1.77	.02
Task x Sound	1	.01	.00
Order x Sound	1	1.13	.01
Task x Order x Sound	1	1.03	.01
Ambiguity x Sound	1	4.13*	.04
Task x Ambiguity x Sound	1	1.32	.00
Order x Ambiguity x Sound	1	.00	.00
Task x Order x Ambiguity x Sound	1	.38	.00
Task x Creative Personality Scale	1	.21	.00
Order x Creative Personality Scale	1	1.85	.02
Task x Order x Creative Personality Scale	1	.07	.00

Table 33. Continued

Ambiguity x Creative Personality Scale	1	.02	.00
Task x Ambiguity x Creative Personality Scale	1	.22	.00
Order x Ambiguity x Creative Personality Scale	1	.00	.00
Task x Order x Ambiguity x Creative Personality Scale	1	.41	.00
Creative Personality Scale x Sound	1	1.36	.00
Task x Creative Personality Scale x Sound	1	.00	.00
Order x Creative Personality Scale x Sound	1	.77	.01
Task x Order x Creative Personality Scale x Sound	1	1.08	.01
Ambiguity x Creative Personality Scale x Sound	1	.12	.00
Task x Ambiguity x Creative Personality Scale x Sound	1	.00	.00
Order x Ambiguity x Creative Personality Scale x Sound	1	.02	.00
Task x Order x Ambiguity x Creative Personality Scale x Sound	1	.90	.01
Error	109		
Total	144		
Corrected Total	143		

* $p < .05$ ** $p < .01$ *** $p < .001$.

The fourth factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and Creativity (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed a significant effects for Ambiguity, $F(1, 101) = 23.86$, $p < .001$, and sound, $F(1, 101) = 25.55$, $p < .001$. To view this ANOVA, refer to Table 34.

Table 34. The Relationship Between Creativity and Performance on Color Tasks in Males

Source	df	F	Partial Eta Squared
Corrected Model	34	2.92***	.50
Intercept	1	.00	.00
Full-scale IQ	1	1.70	.02
Extraversion	1	23.74***	.18
Psychoticism	1	.55	.01
Task	1	1.59	.02
Order	1	.00	.00
Ambiguity	1	23.86***	.18
Sound	1	25.55***	.19
Creativity	1	3.74	.04
Task x Order	1	.47	.01
Task x Ambiguity	1	4.04	.04
Order x Ambiguity	1	.07	.00
Task x Order x Ambiguity	1	2.33	.01
Task x Sound	1	.07	.00
Order x Sound	1	1.23	.00
Task x Order x Sound	1	1.57	.02
Ambiguity x Sound	1	2.80	.03
Task x Ambiguity x Sound	1	2.62	.03
Order x Ambiguity x Sound	1	.16	.00

Table 34. Continued

Task x Order x Ambiguity x Sound	1	.77	.01
Task x Creativity	1	.11	.00
Order x Creativity	1	.01	.00
Task x Order x Creativity	1	7.00**	.07
Ambiguity x Creativity	1	1.41	.00
Task x Ambiguity x Creativity	1	1.01	.00
Order x Ambiguity x Creativity	1	.00	.00
Task x Order x Ambiguity x Creativity	1	.06	.00
Creativity x Sound	1	1.08	.00
Task x Creativity x Sound	1	.61	.01
Order x Creativity x Sound	1	.14	.00
Task x Order x Creativity x Sound	1	.04	.00
Ambiguity x Creativity x Sound	1	.16	.00
Task x Ambiguity x Creativity x Sound	1	.72	.01
Order x Ambiguity x Creativity x Sound	1	.78	.01
Task x Order x Ambiguity x Creativity x Sound	1	.47	.01
Error	101		
Total	136		
Corrected Total	135		

** $p < .01$ *** $p < .001$.

Females

Four factorial ANOVA's were conducted to investigate the effect of scores on the Alternate Uses Test, the Remote Associates Test, the Creative Personality Scale, and Creativity on color judgment reaction time. Scores on all four creativity measures were dichotomized using a median split. The first factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and scores on the Alternate Uses Test (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed that those who had higher scores on the Alternate Uses Test had significantly faster reaction times (M = 753.81, SE = 30.63) than those who scored lower (M = 942.78, SE = 35.10), $F(1, 109) = 13.47, p < .001$. The results also revealed significant effects for Ambiguity, $F(1, 109) = 47.61, p < .001$, and Sound, $F(1, 109) = 30.81, p < .001$. To view this ANOVA, refer to Table 35.

Table 35. The Relationship Between Scores on the Alternate Uses Test and Performance on Color Tasks in Females

Source	df	F	Partial Eta Squared
Corrected Model	34	4.22***	.57
Intercept	1	8.58**	.06
Full-Scale IQ	1	2.89	.03
Extraversion	1	4.15*	.04
Psychoticism	1	18.31***	.13
Task	1	7.31**	.05
Order	1	.45	.00
Ambiguity	1	47.61***	.30
Sound	1	30.81***	.21
Alternate Uses Test	1	13.47***	.10
Task x Order	1	2.73	.03
Task x Ambiguity	1	5.44*	.05
Order x Ambiguity	1	.03	.00
Task x Order x Ambiguity	1	.04	.00
Task x Sound	1	.86	.01
Order x Sound	1	.34	.00
Task x Order x Sound	1	.20	.00
Ambiguity x Sound	1	3.84	.02
Task x Ambiguity x Sound	1	.42	.00
Order x Ambiguity x Sound	1	.10	.00
Task x Order x Ambiguity x Sound	1	3.17	.03
Task x Alternate Uses Test	1	1.92	.02
Order x Alternate Uses Test	1	1.37	.00

Table 35. Continued

Task x Order x Alternate Uses Test	1	2.30	.01
Ambiguity x Alternate Uses Test	1	1.15	.00
Task x Ambiguity x Alternate Uses Test	1	.13	.00
Order x Ambiguity x Alternate Uses Test	1	.32	.00
Task x Order x Ambiguity x Alternate Uses Test	1	.79	.01
Alternate Uses Test x Sound	1	.04	.00
Task x Alternate Uses Test x Sound	1	.11	.00
Order x Alternate Uses Test x Sound	1	.04	.00
Task x Order x Alternate Uses Test x Sound	1	.08	.00
Ambiguity x Alternate Uses Test x Sound	1	.81	.01
Task x Ambiguity x Alternate Uses Test x Sound	1	.00	.00
Order x Ambiguity x Alternate Uses Test x Sound	1	1.25	.01
Task x Order x Ambiguity x Alternate Uses Test x Sound	1	.08	.00
Error	109		
Total	144		
Corrected Total	143		

* $p < .05$ ** $p < .01$ *** $p < .001$.

The second factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and scores on the Remote Associates Test (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed significant effects for Ambiguity, F (1, 109) = 43.51, $p < .001$, and Sound, F (1, 109) = 32.54, $p < .001$. There was also a significant interaction between scores on the Remote Associates Test and Sound, F (1, 109) = 7.65, $p < .01$. (see Figure 4). To view this ANOVA, refer to Table 36.

Table 36. The Relationship Between Scores on the Remote Associates Test and Performance on Color Tasks in Females

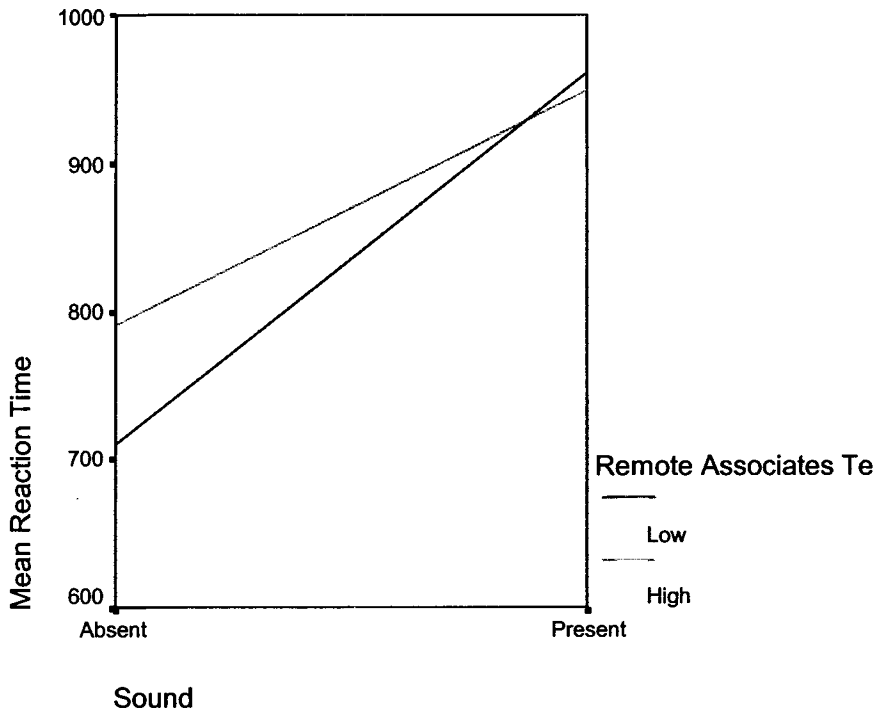
Source	df	F	Partial Eta Squared
Corrected Model	34	3.97***	.54
Intercept	1	16.37***	.12
Full-scale IQ	1	.29	.00
Extraversion	1	6.76*	.06
Psychoticism	1	8.72*8	.06
Task	1	7.61**	.07
Order	1	.03	.00
Ambiguity	1	43.50***	.29
Sound	1	32.54***	.22
Remote Associates Test	1	2.130	.02
Task x Order	1	3.37	.02
Task x Ambiguity	1	5.75*	.04
Order x Ambiguity	1	.04	.00
Task x Order x Ambiguity	1	.03	.00
Task x Sound	1	1.07	.01
Order x Sound	1	.47	.00
Task x Order x Sound	1	1.29	.00
Ambiguity x Sound	1	5.11*	.05
Task x Ambiguity x Sound	1	.33	.00
Order x Ambiguity x Sound	1	.01	.00
Task x Order x Ambiguity x Sound	1	3.50	.02
Task x Remote Associates Test	1	.99	.01
Order x Remote Associates Test	1	.86	.01

Table 36. Continued

Task x Order x Remote Associates Test	1	2.62	.01
Ambiguity x Remote Associates Test	1	1.35	.00
Task x Ambiguity x Remote Associates Test	1	.33	.00
Order x Ambiguity x Remote Associates Test	1	1.44	.00
Task x Order x Ambiguity x Remote Associates Test	1	.02	.00
Remote Associates Test x Sound	1	7.65**	.07
Task x Remote Associates Test x Sound	1	.16	.00
Order x Remote Associates Test x Sound	1	.43	.00
Task x Order x Remote Associates Test x Sound	1	.21	.00
Ambiguity x Remote Associates Test x Sound	1	.10	.00
Task x Ambiguity x Remote Associates Test x Sound	1	.28	.00
Order x Ambiguity x Remote Associates Test x Sound	1	.00	.00
Task x Order x Ambiguity x Remote Associates Test x Sound	1	1.33	.00
Error	109		
Total	144		
Corrected Total	143		

* $p < .05$ ** $p < .01$ *** $p < .001$.

Figure 4. The interaction between scores on the Remote Associates Test and Sound in females



The third factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and scores on the Creative Personality Scale (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed significant effects for Ambiguity, $F\,(1, 109) = 40.28, p < .001$, and Sound, $F\,(1, 109) = 30.78, p < .001$. There was also a significant interaction between scores on the Creative Personality Scale and Sound, $F\,(1, 109) = 5.01, p < .05$ (see Figure 5). To view this ANOVA, refer to Table 37.

Table 37. The Relationship Between Scores on the Creative Personality Scale and Performance on Color Tasks in Females

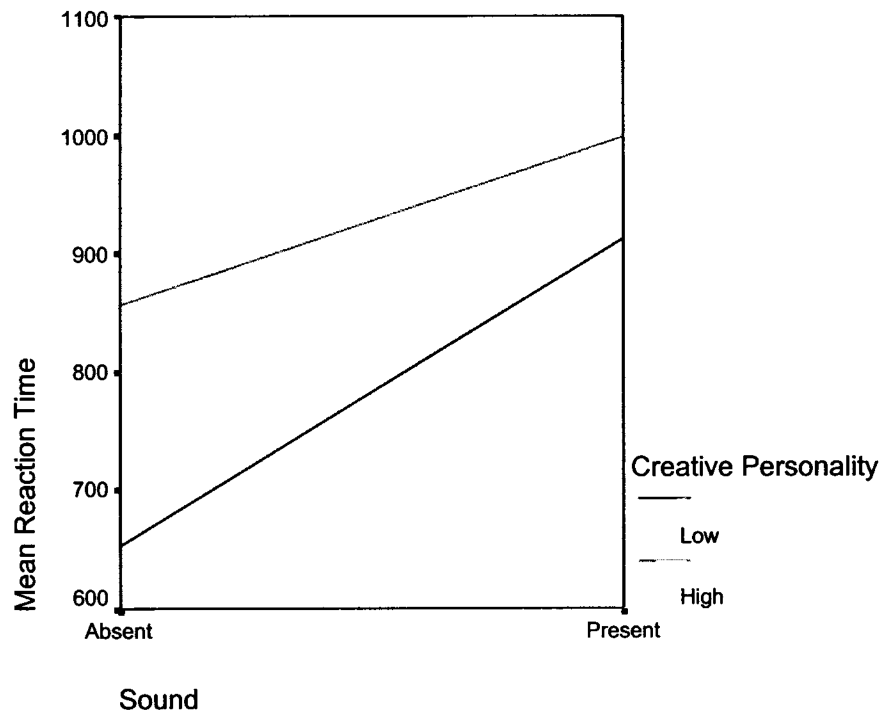
Source	df	F	Partial Eta Squared
Corrected Model	34	4.17***	.57
Intercept	1	21.72***	.17
Full-scale IQ	1	.134	.00
Extraversion	1	7.75**	.07
Psychoticism	1	10.91**	.08
Task	1	6.26*	.04
Order	1	.00	.00
Ambiguity	1	40.28***	.26
Sound	1	30.78***	.21
Creative Personality Scale	1	.35	.00
Task x Order	1	2.12	.02
Task x Ambiguity	1	5.35*	.05
Order x Ambiguity	1	.07	.00
Task x Order x Ambiguity	1	.11	.00
Task x Sound	1	1.16	.00
Order x Sound	1	.41	.00
Task x Order x Sound	1	1.48	.00
Ambiguity x Sound	1	6.50*	.06
Task x Ambiguity x Sound	1	.62	.01
Order x Ambiguity x Sound	1	.02	.00
Task x Order x Ambiguity x Sound	1	2.37	.01
Task x Creative Personality Scale	1	2.63	.01
Order x Creative Personality Scale	1	.08	.00
Task x Order x Creative Personality Scale	1	6.78*	.06

Table 37. Continued

Ambiguity x Creative Personality Scale	1	1.52	.00
Task x Ambiguity x Creative Personality Scale	1	.04	.00
Order x Ambiguity x Creative Personality Scale	1	.18	.00
Task x Order x Ambiguity x Creative Personality Scale	1	.03	.00
Creative Personality Scale x Sound	1	5.01*	.03
Task x Creative Personality Scale x Sound	1	.10	.00
Order x Creative Personality Scale x Sound	1	.50	.01
Task x Order x Creative Personality Scale x Sound	1	.92	.01
Ambiguity x Creative Personality Scale x Sound	1	.11	.00
Task x Ambiguity x Creative Personality Scale x Sound	1	.97	.01
Order x Ambiguity x Creative Personality Scale x Sound	1	.29	.00
Task x Order x Ambiguity x Creative Personality Scale x Sound	1	3.25	.03
Error	109		
Total	144		
Corrected Total	143		

* $p < .05$ ** $p < .01$ *** $p < .001$.

Figure 5. The interaction between scores on the Creative Personality Scale and Sound in females



Finally, the fourth factorial ANOVA involved Task (Red-Yellow vs. Blue-Green), Order (first vs. second), Ambiguity (ambiguous vs. unambiguous), Sound (presence vs. absence), and Creativity (high vs. low) as fixed factors, Full-scale IQ, Extraversion, and Psychoticism as covariates (see above), and reaction time in making color judgment as the dependent variable. The results revealed significant effects for Ambiguity, $F(1, 109) = 37.95, p < .001$, and Sound, $F(1, 109) = 30.08, p < .001$. There was also a significant interaction between scores on the Creative Personality Scale and Sound, $F(1, 109) = 5.39, p < .05$. (see Figure 6). To view this ANOVA, refer to Table 38.

Table 38. The Relationship Between Scores on Creativity and Performance on Color Task in Females

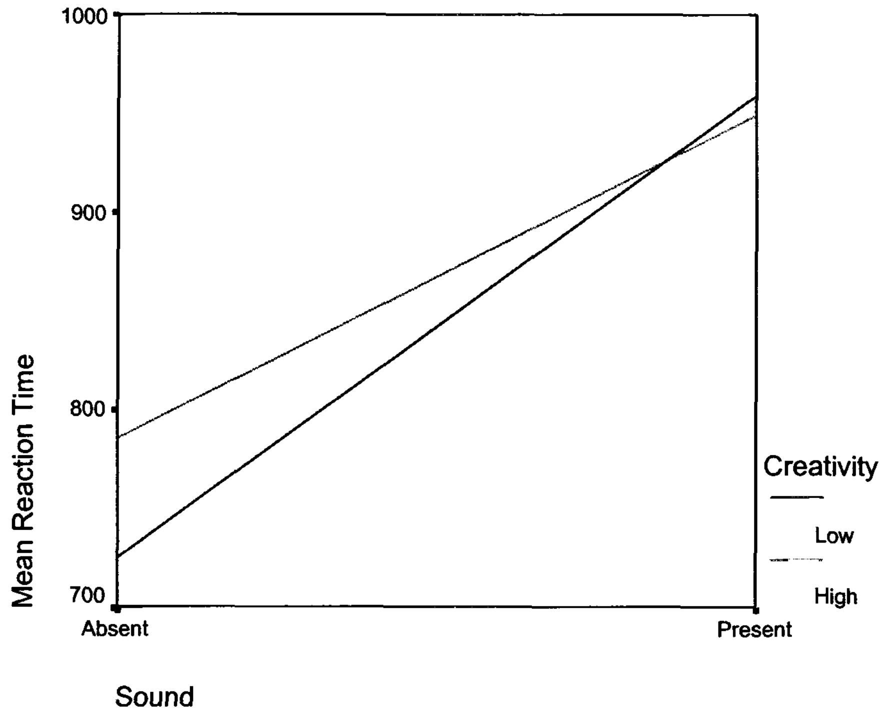
Source	df	F	Partial Eta Squared
Corrected Model	34	4.08***	.55
Intercept	1	12.63**	.10
Full-scale IQ	1	.00	.00
Extraversion	1	5.59*	.05
Psychoticism	1	9.75**	.07
Task	1	6.69*	.06
Order	1	.01	.00
Ambiguity	1	37.95***	.26
Sound	1	30.08***	.22
Creativity	1	.21	.00
Task x Order	1	2.62	.01
Task x Ambiguity	1	5.87*	.04
Order x Ambiguity	1	.03	.00
Task x Order x Ambiguity	1	.21	.00
Task x Sound	1	1.26	.01
Order x Sound	1	.34	.00
Task x Order x Sound	1	1.54	.00
Ambiguity x Sound	1	5.44*	.05
Task x Ambiguity x Sound	1	.68	.01
Order x Ambiguity x Sound	1	.03	.00

Table 38. Continued

Task x Order x Ambiguity x Sound	1	2.99	.03
Task x Creativity	1	1.73	.02
Order x Creativity	1	.33	.00
Task x Order x Creativity	1	4.83*	.03
Ambiguity x Creativity	1	2.79	.03
Task x Ambiguity x Creativity	1	.02	.00
Order x Ambiguity x Creativity	1	.64	.01
Task x Order x Ambiguity x Creativity	1	.41	.00
Creativity x Sound	1	5.39*	.05
Task x Creativity x Sound	1	.02	.00
Order x Creativity x Sound	1	.74	.01
Task x Order x Creativity x Sound	1	.74	.01
Ambiguity x Creativity x Sound	1	.05	.00
Task x Ambiguity x Creativity x Sound	1	1.23	.00
Order x Ambiguity x Creativity x Sound	1	.47	.00
Task x Order x Ambiguity x Creativity x Sound	1	1.43	.00
Error	109		
Total	144		
Corrected Total	143		

* $p < .05$ ** $p < .01$ *** $p < .001$.

Figure 6. The interaction between scores on Creativity and Sound in females



Discussion

The results demonstrated that averaged across all trials, females had faster reaction times than males. This finding is consistent with the results of Saucier, Elias, and Nylen (2002), who found that females were significantly faster than males in a color-naming task. In that experiment, females were also found to be faster in naming shapes that were presented one stimulus at a time. Because of the generality of the advantage across colors and shapes, the authors concluded that the "female advantage on color naming is simply a manifestation of a more general superiority at speeded naming tasks, not a 'special factor of color naming'" (Saucier, Elias, & Nylen, 2002, p. 27).

In males, higher scores on the Alternate Uses Test and the Remote Associates Test were associated with faster reaction times. In females, higher scores on the Alternate Uses Test was associated with faster reaction times. Kwiatkowski, Vartanian, and Martindale (1999) had interpreted their findings as indicating that creative people may be faster in simple reaction time tasks, but slower in tasks that entail ambiguity or complexity. The color tasks were designed to test the ambiguity and complexity interpretations respectively. Regarding ambiguity, the experimenter had predicted an interaction effect: Creative participants would be faster in identifying colors in the unambiguous condition, but slower in identifying colors in the ambiguous condition. This hypothesis was not supported. There was no interaction between any potential creativity measure and Ambiguity. Regarding complexity, it was predicted that creative people would be slower in identifying ambiguous colors when such trials were coupled with a tone detection task. This hypothesis was tested using three-way interactions among potential creativity, Ambiguity, and Sound. The three-way interactions were not significant.

In females, the significant interactions between Sound and three measures of potential creativity (Remote Associates Test, Creative Personality Scale, and Creativity) indicated that for creative people, the addition of a concurrent task was less detrimental to the performance compared to noncreative participants. This finding did not support the conclusions of Kwiatkowski, Vartanian, and Martindale (1999), who had found that creative people may be slower on tasks that the entail conflict.

General Discussion

The experiments in this dissertation were conducted to test a disinhibition theory of creativity. Although there is much overlap between Eysenck's (1995) and Martindale's (1999) versions of that theory, one key difference remains: Eysenck treated disinhibition in creative people as if it were a rather permanent characteristic of their cognitive style. For this reason, Eysenck (1983, 1995) argued that although it is difficult to determine whether creativity is a cognitive ability or a personality trait, he preferred to view it as a personality trait. He argued that despite the fact that cognition is affected by situational factors, cognitive disinhibition causes creative people to maintain a stylistic tendency to process information in a particular (i.e., defocused) way across situations. Martindale (1999) on the other hand has argued that the thinking of creative people is characterized by their flexibility in focusing and defocusing attention depending on situational factors. Although all four experiments were employed to test the disinhibition theory, the dichotic listening task in particular was employed to test the different predictions that were made based on Eysenck's (1995) and Martindale's (1999) theories.

In the cross-modular priming task, participants were presented with pairs of stimuli and instructed to determine whether the stimuli within each pair were related. The results demonstrated that averaged across all trials, participants who had higher scores on the Remote Associates Test were faster in determining relations between stimuli. This finding was interpreted using the neural-network model of cognition (Martindale, 1991): Due to lower cognitive inhibition in creative people, priming a node is more likely to activate other nodes that are related to it, thus making it easier to determine whether a relation exists between the primed node and other nodes that are activated as a result. This finding supports the disinhibition theory, and Martindale's (1999) theory in particular: In the absence of specific instructions to focus attention, creative people have the ability to defocus attention and thereby bring more concepts into the focus of consciousness. In line with the results of Kwiatkowski, Varatanian, and Martindale (1999), there was no relationship between Psychoticism and reaction time. This finding suggests that Psychoticism is not involved in mediating the relationship between cognitive inhibition and reaction time.

Equally important, the results did not demonstrate a significant interaction between priming condition and scores on the Remote Associates Test. This suggests that the difference in reaction time latency between creative and noncreative participants did not vary as a function of priming condition. In terms of cross-modular priming, the target condition that was of most interest was the pictorial condition. That condition represented an unambiguous example of priming across different modalities. The fact that there was no relationship between scores on the Remote Associates Test and reaction time on that target condition suggests that creative participants are not faster in making associations between nodes in different modalities per se. Rather, given the global advantage of participants who scored higher on the Remote Associates Test when the dependent variable was the average reaction time across conditions, the results suggest that creative people may be faster in making associations between concepts in general.

The results of the proactive inhibition task did not support the prediction of the disinhibition hypothesis. It was hypothesized that due to lower levels of cognitive inhibition, creative participants would show lower performance decrements across trials. In fact, creative participants recalled fewer words than did their noncreative counterparts on the third trial (see Figure 3). One speculation for this outcome is that performance on the proactive inhibition task is not be a function of the baseline level of cognitive inhibition per se, but it is rather a function of how cognitive inhibition builds up across successive trials. If so, the results of this task demonstrate that inhibition, and in particular *lateral* inhibition that occurs as a result of activating nodes within the same level of a module (Martindale, 1991), builds up more quickly in creative people than it does in noncreative people. However, as mentioned above, it is not clear why creative participants seem to have experienced a release from proactive inhibition on trial 4, *prior* to semantic category change.

The results in the word list condition of the dichotic listening task demonstrated that participants who had higher scores on the Creative Personality Scale had better memory for words presented to the shadowed channel. This result replicated the findings of Rawlings (1985) in his focused attention condition, and supported Martindale's (1999) theory according to which when given cues to focus attention, creative people have the ability to do so successfully. The results do not support Eysenck's (1995) contention that creative people have a general tendency to defocus attention, and to sample environmental stimuli in a less discriminate manner. In addition, it was found that participants who had higher scores on the Remote Associates Test recalled more words from the unshadowed channel, but only in the high-association condition. These results replicated Dykes and McGhie's (1976) findings, where it was found that creative participants switched from the attended to the unattended message only when conditions were favorable to do so, as was the case when there was a high association between word pairs that were presented simultaneously. As discussed above, Rawlings (1985) indicated some of the methodological problems of that study, most notably the notion that contrary to Dykes and McGhie's (1976) instructions, participants may have relied on a divided attention approach in the second half of the study, which might have been the word list condition. Rawlings' (1985) criticism may have applied to the design of the experiment in this dissertation as well, were it not for the fact that participants were assigned randomly to the word list and prose conditions, thus eliminating the advantage to any one condition in particular.

The color tasks were designed to test some of the conclusions drawn by Kwiatkowski, Vartanian, and Martindale (1999). Briefly, the results of that study had demonstrated that creative people had faster reaction times in the Concept Verification Task, a paradigm that was deemed to involve no ambiguity. However, creative people had slower reaction times in the negative priming task, implying that compared to noncreative people, they may be slower on tasks that involve ambiguity or complexity. The results of the color tasks demonstrated that creative people were faster than noncreative people regardless of the ambiguity of the stimuli. Thus, compared to its effect on noncreative people, ambiguity did not have an especially detrimental effect on the performance of creative people. As an aside, it is also important to note that the experimenter did not vary the ambiguity of the stimuli according to a universal metric. Thus, stimuli that were presumed to be ambiguous by the experimenter may not have appeared ambiguous to the participants. However, the results demonstrated that participants required a significantly longer time to identify stimuli that were labeled as ambiguous by the experimenter. This suggests that the ambiguity manipulation may have been successful.

In the color tasks, complexity was operationalized in terms of dual task demands, such that on some trials participants were required to respond to a tone in addition to performing the color identification task. In females, the results demonstrated that the performance of creative participants deteriorated less than did the performance of noncreative participants. There was no three-way interaction between creativity, Sound, and Ambiguity, meaning that the detrimental effect of Sound on the reaction time latencies of creative participants was not especially pronounced on trials that involved the presentation of ambiguous stimuli. Overall, two conclusions can be drawn from the results of the color tasks: First, creative people were faster in a task that required them to interpret stimuli of variable ambiguity. Second, in a task that involved interpreting stimuli of variable ambiguity, the reaction time latencies of creative female participants were affected less by complexity than were the reaction times of their noncreative counterparts.

The Status of the Disinhibition Theory of Creativity

Considering that the four experiments discussed in this dissertation were conducted to test the disinhibition theory of creativity, it is important to assess the status of the theory as a result. With respect to the Remote Associates Test, the findings of the cross-modular priming task supported the predictions of the theory. The Remote Associates Test is a test that was designed to measure a subject's ability to discover association among three words. Thus, it is not surprising that scores on this test were related to reaction time in determining relations between stimuli in the cross-modular priming task. The results of the proactive inhibition task did not support the theory. Overall, the results of the dichotic listening task supported Martindale's (1999) version of the disinhibition theory. Participants with higher scores on the Creative Personality Scale people were able to focus attention successfully when instructed to do so. However, for those who scored higher on the Remote Associates Test, there was a tendency to switch to the unattended ear when the conditions were most favorable for doing so. Finally, the results of the color tasks indicate that creative people were faster than noncreative people in interpreting perceptual stimuli. In addition, compared to their noncreative counterparts, the reaction time latencies of creative female were affected less detrimentally by the addition of a concurrent task. While not a direct test of the disinhibition theory, those results indicate that the slow reaction times that were found for creative participants in a negative priming task (Kwiatkowski, Vartanian, & Martindale, 1999) may not have been due to the ambiguity or the complexity of the task.

REFERENCES

Amabile, T. M. (1982). *The social psychology of creativity.* New York: Springer-Verlag.

Anderson, J. R. (1984). Spreading activation. In J. R. Anderson & S. M. Kosslyn (Eds.), *Tutorials in learning and memory* (pp. 61-90). San Francisco: Freeman.

Andreasen, N. C. (1987). Creativity and mental illness: Prevalence rates in writers and their first-degree relatives. *American Journal of Psychiatry, 144*, 1288-1292.

Barron, F. (1969). *Creative person and creative process.* New York: Holt, Rinehart, & Winston.

Beech, A. R., & Claridge, G. (1987). Individual differences in negative priming. *British Journal of Psychology, 78*, 349-356.

Beech, A. R., Powell, T., McWilliam, J., & Claridge, G. (1989). Evidence of reduced cognitive inhibition in schizophrenia. *British Journal of Clinical Psychology, 28*, 109-116.

Benjafield, J. G. (1997). *Cognition* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Besner, D., Davies, J., & Daniels, S. (1981). Reading for meaning: The effects of concurrent articulation. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology, 33A*, 415-437.

Claridge, G. (1993). When is Psychoticism Psychoticism? And how does it really relate to creativity? *Psychological Inquiry, 4*, 184-188.

Claridge, G. S., Clarke, K. H., & Beech, A. R. (1992). Lateralization of the negative priming effect: Relationships with schizotypy and with gender. *British Journal of Psychology, 83*, 13-25.

Claridge, G. S., Robinson, D. L., & Birchall, P. M. A. (1985). Psychophysiological evidence of "Psychoticism" in schizophrenics' relatives. *Personality and Individual Differences, 6*, 1-10.

Dempster, F. N. (1991). Inhibitory processes: A neglected dimension of intelligence. *Intelligence, 15*, 157-173.

Desimone, R., & Duncan, J. (1995). Neural mechanisms of selective visual attention. *Annual Review of Neuroscience, 18*, 193-222.

Duncan, J. (1998). Converging levels of analysis in the cognitive neuroscience of visual attention. *Philosophical Transaction of the Royal Society of London B, 353*, 1307-1317.

Dykes, M., & McGhie, A. (1976). A comparative study of attentional strategies in schizophrenics and highly creative normal subjects. *British Journal of Psychiatry, 128*, 50-56.

E-Prime [Computer software]. (2000). Pittsburgh, PA: Psychology Software Tools, Inc.

Eysenck, H. J. (1983). The roots of creativity: Cognitive ability or personality trait? *Roeper Review, 5*, 10-12.

Eysenck, H. J. (1993). Creativity and personality: Suggestions for a theory. *Psychological Inquiry, 4*, 147-178.

Eysenck, H. J. (1995). *Genius: The natural history of creativity.* Cambridge, UK: Cambridge University Press.

Eysenck, H. J., & Eysenck, S. B. G. (1994). *Manual of the Eysenck Personality Questionnaire (EPQ-R Adult).* San Diego, CA: EDITS.

Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review, 2*, 290-309.

Feist, G. J. (1999). The influence of personality on artistic and scientific creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 273-296). New York: Cambridge University Press.

Fodor, J. A. (1983). *The modularity of the mind.* Cambridge, MA: MIT Press.

Ginsburg, G. P., & Whittemore, R. G. (1968). Creativity and verbal ability: A direct examination of their relationship. *British Journal of Educational Psychology, 38*, 133-139.

Götz, K. O., & Götz, K. (1979a). Personality characteristics of professional artists. *Perceptual and Motor Skills, 49*, 327-334.

Götz, K. O., & Götz, K. (1979b). Personality characteristics of successful artists. *Perceptual and Motor Skills, 49*, 919-924.

Gough, H. G. (1979). A creative personality scale for the adjective checklist. *Journal of Personality and Social Psychology, 37*, 1398-1405.

Heston, I. I. (1966). Psychiatric disorders in foster-home-reared children of schizophrenic mothers. *British Journal of Psychiatry, 112*, 819-825.

Karlsson, J. I. (1968). Genealogic studies of schizophrenia. In D. Rosenthal, & S. S. Kety (Eds.), *The transmission of schizophrenia* (pp. 201-236). Oxford: Pergamon Press.

Karlsson, J. I. (1970). Genetic association of giftedness and creativity with schizophrenia. *Hereditas, 66*, 177-182.

Knorr, E., & Neubauer, A. C. (1996). Speed of information-processing in an inductive reasoning task and its relationship to psychometric intelligence. Personality and Individual Differences, 20, 653-660.

Konorski, J. (1967). *Integrative activity of the brain*. Chicago, IL: University of Chicago Press.

Kris, E. (1952). *Psychoanalytic explorations in art*. New York: International Universities Press.

Kwiatkowski, J., Vartanian, O., & Martindale, C. (1999). Creativity and speed of mental processing. *Empirical Studies of the Arts, 17*, 187-196.

Larson, G. E., & Saccuzzo, D. P. (1986). Gender, neuroticism, and speed-accuracy tradeoffs on a choice reaction-time task. *Personality and Individual Differences, 7*, 919-921.

Martindale, C. (1989). Personality, situation, and creativity. In J. Glover, R. R. Ronning, & C. R. Reynolds (Eds.), *Handbook of creativity* (pp. 211-228). New York: Plenum.

Martindale, C. (1991). *Cognitive psychology: A neural-network approach*. Pacific Grove, CA: Brooks/Cole.

Martindale, C. (1995). Creativity and connectionism. In S. M. Smith, T. B. Ward, & R. A., Finke (Eds.), *The creative cognition approach* (pp. 249-268). Cambridge, MA: MIT Press.

Martindale, C. (1999). Biological bases of creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 137-152). New York: Cambridge University Press.

Martindale, C., & Dailey, A. (1996). Creativity, primary process cognition, and personality. *Personality and Individual Differences, 20*, 409-414.

Martindale, C., & Hines, D. (1975). Creativity and cortical activation during creative, intellectual, and EEG feedback tasks. *Biological Psychology, 3*, 71-80.

Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review, 69*, 220-232.

Mednick, S. A., & Mednick, M. T. (1967). *Examiner's manual: Remote Associates Test*. Boston, MA: Houghton Mifflin.

Mendelsohn, G. A. (1976). Associative and attentional processes in creative performance. *Journal of Personality, 44*, 341-369.

Merten, T., & Fischer, I. (1999). Creativity, personality, and word association responses: Associative behaviour in forty supposedly creative persons. *Personality and Individual Differences, 27*, 933-942.

Microsoft Word [Computer software]. (2000). Redmond, WA: Microsoft Inc.

Munsell, A. H. (1929). *Munsell book of color*. Baltimore, MD: Munsell Color Company.

Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology, 9*, 353-383.

Palermo, D. S., & Jenkins, J. J. (1964). *Word association norms: Grade school through college*. Minneapolis: University of Minnesota Press.

Pashler, H. E. (1998). *The psychology of attention*. Cambridge, MA: MIT Press.

Payne, D. G., & Wenger, M. J. (1998). *Cognitive Psychology*. Boston, MA: Houghton Mifflin.

Photoshop 6.0.1 [Computer software]. (2001). San Jose, CA: Adobe Systems Inc.

Plucker, J. A., & Renzulli, J. S. (1999). Psychometric approaches to the study of human creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 35-61). New York: Cambridge University Press.

Rawlings, D. (1985). Psychoticism, creativity and dichotic shadowing. *Personality and Individual Differences, 6*, 737-742.

Rumelhart, D. E., Hinton, G., & McClelland, J. L. (1986). A general framework for parallel distributed processing. In D. E. Rumelhart, & J. L. McClelland (Eds.), *Parallel distributed processing* (Vol. 1, pp. 45-76). Cambridge, MA: MIT Press.

Rushton, J. P. (1990). Creativity, intelligence, and Psychoticism. *Personality and Individual Differences, 11*, 1291-1298.

Saucier, D. M., Elias, L. J., & Nylen, K. (2002). Are colors special? An examination of the female advantage for speeded color naming. *Personality and Individual Differences, 32*, 27-35.

Smith, G. J. W., & van der Meer, G. (1990). Creativity in old age. *Creativity Research Journal, 3*, 249-264.

Smith, G. J. W., & van der Meer, G. (1994). Creativity through psychosomatics. *Creativity Research Journal, 7*, 159-170.

Sternberg, R. J. (Ed.). (1999). *Handbook of creativity*. New York: Cambridge University Press.

Sternberg, R. J., & Lubart, T. I. (1993). Investing in creativity. *Psychological Inquiry, 4*, 229-232.

Sternberg, R. J. & O'Hara, L. A. (1999). Creativity and intelligence. In R. J.

Sternberg (Ed.), *Handbook of creativity* (pp. 251-272). New York: Cambridge University Press.

Tipper, S. P., & Driver, J. (1982). Negative priming between pictures and words in a selective attention task: Evidence for semantic processing of ignored stimuli. *Memory and Cognition, 16*, 64-70.

Torrance, E. P. (1993). Understanding creativity: Where to start? *Psychological Inquiry, 4*, 232-234.

Treisman, A. (1999). Feature binding, attention and object perception. In G. W. Humphreys, J. Duncan, & A. Treisman (Eds.), *Attention, space and action: Studies in cognitive neuroscience* (pp. 91-111). Oxford: Oxford University Press.

Vartanian, O., & Martindale, C. (2001). Cognitive disinhibition: The link between attention and creativity. *Canadian Psychology, 42*, 24.

Vartanian, O., Poroshina, T., & Dorfman, L. (2001, June). *An investigation of the relationship between Psychoticism and creativity among Russian artists.* Poster presented at the meeting of the American Psychological Society, Toronto, Canada.

Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children: A study of the creativity-intelligence distinction*. New York: Holt, Rinehart, & Winston.

Wechsler, D. (1997). *Wechsler Adult Intelligence Scale* (3rd ed). San Antonio, TX: Psychological Corporation.

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence.* San Antonio, TX: Psychological Corporation.

Wickens, D. D. (1973). Some characteristics of word encoding. *Memory and*

Cognition, 1, 485-490.

Wink, G. I. (1984). A personality study of musicians working in the popular field. *Personality and Individual Differences, 5*, 359-360.

Appendix A – Remote Associates Norms

For the Remote Associates Test, items with updated norms were obtained from http://www.socrates.berkeley.edu/~kihlstrm/remote_associates_test.html.

Appendix B – Creativity Test Instructions

Alternate Uses Test

INSTRUCTIONS: On each of the next three pages will appear the name of a familiar object. Write down all the different ways you can think of in which the object might be used. Do not hesitate to write down whatever ways you can think of in which the object might be used as long as they are possible uses for the object. Try to be as original and creative as you can. Write each use on a separate line.

Brick

Shoe

Newspaper

Remote Associates Test

INSTRUCTIONS: In this test you are presented with three words and asked to find a fourth work which is related to all three. Write this word in the space to the right.

			Correct Responses
Falling	Actor	Dust	Star
Broken	Clear	Eye	Glass
Skunk	Kings	Boiled	Cabbage
Widow	Bite	Monkey	Spider
Bass	Complex	Sleep	Deep
Coin	Quick	Spoon	Silver
Gold	Stool	Tender	Bar
Time	Hair	Stretch	Long
Cracker	Union	Rabbit	Jack
Bald	Screech	Emblem	Eagle
Blood	Music	Cheese	Blue
Manners	Round	Tennis	Table
Off	Trumpet	Atomic	Blast
Playing	Credit	Report	Card
Rabbit	Cloud	House	White
Room	Blood	Salts	Bath
Salt	Deep	Foam	Sea
Square	Cardboard	Open	Box
Water	Tobacco	Stove	Pipe

Ache	Hunter	Cabbage	Head
Chamber	Staff	Box	Music
High	Book	Sour	Note
Lick	Sprinkle	Mines	Salt
Pure	Blue	Fall	Water
Square	Telephone	Club	Book
Surprise	Wrap	Care	Gift
Ticket	Shop	Broker	Pawn
Barrel	Root	Belly	Beer
Blade	Witted	Weary	Dull
Cherry	Time	Smell	Blossom

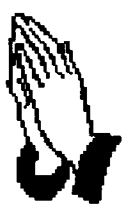
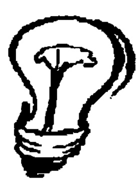
Creative Personality Scale

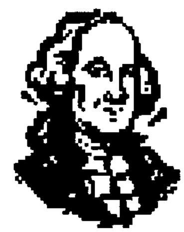
INSTRUCTIONS: Please check all of the words that you would use to describe yourself.

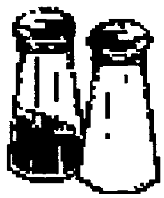
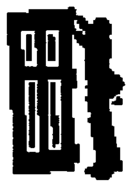
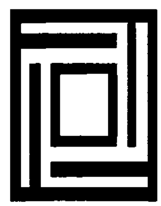
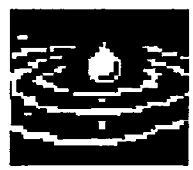
Please check only the words that you would use to describe yourself.

	Affected	_____		Intelligent	_____
1.	Capable	_____	16.	Interests-narrow	_____
2.	Cautious	_____	17.	Interests-wide	_____
3.	Clever	_____	18.	Inventive	_____
4.	Commonplace	_____	19.	Mannerly	_____
5.	Confident	_____	20.	Original	_____
6.	Conservative	_____	21.	Reflective	_____
7.	Conventional	_____	22.	Resourceful	_____
8.	Dissatisfied	_____	23.	Self-confident	_____
9.	Egotistical	_____	24.	Sexy	_____
10.	Honest	_____	25.	Sincere	_____
11.	Humorous	_____	26.	Snobbish	_____
12.	Individualistic	_____	27.	Submissive	_____
13.	Informal	_____	28.	Suspicious	_____
14.	Insightful	_____	29.	Unconventional	_____

Appendix C – Cross-modular Priming Task Stimuli

Prime	Semantic	Pictorial	Graphemic	Unrelated	Unrelated Pictorial
TABLE	CHAIR		CABLE	SMOOTH	
MAN	WOMAN		CAN	CLASH	
HOUSE	HOME		MOUSE	GROUND	
HAND	FOOT		SAND	CLOTH	
LAMP	LIGHT		CAMP	COW	
BREAD	BUTTER		DREAD	WINNER	

SHEEP	WOOL		SHEER	CUTE	
HEAD	HAIR		MEAD	CATTLE	
FINGER	HAND		LINGER	DOUG	
NUMBER	LETTER		LUMBER	YOU	
SHOE	FOOT		SHOT	MANY	
GUN	SHOOT		FUN	WHO	
CAR	TRUCK		CAN	BUSY	

MOON	STAR		LOON	BOY	
SALT	PEPPER		HALT	FISH	
HAMMER	NAIL		HAMPER	THOR	
DOOR	WINDO W		MOOR	SIDE	
LION	TIGER		ZION	HAIRY	
MOUNTAI N	HILL		FOUNTAIN	TRAIN	

Appendix D - Pairwise Comparisons of Reaction Time Latencies Associated With Different Target Conditions in the Cross-modular Priming Task

Table D.1. Pairwise Comparisons of Reaction Time Latencies Associated With Different Target Conditions in the Cross-modular Priming Task

				Mean Difference (I-J)
(I) Target Type	Semantic	(J) Target Type	Semantic	
			Pictorial	106.10**
			Graphemic	86.42*
			Unrelated	-100.11**
			Unrelated Pictorial	-179.88***
	Pictorial	(J) Target Type	Semantic	-106.10**
			Pictorial	
			Graphemic	-19.66
			Unrelated	-206.20***
			Unrelated Pictorial	-285.97***
	Graphemic	(J) Target Type	Semantic	-86.42*
			Pictorial	19.66
			Graphemic	

Table D.1. Continued

		Unrelated	-186.56***
		Unrelated Pictorial	-266.30***
Unrelated	(J) Target Type	Semantic	100.11**
		Pictorial	206.20***
		Graphemic	186.56***
		Unrelated	
		Unrelated Pictorial	-79.76*
Unrelated Pictorial	(J) Target Type	Semantic	179.88***
		Pictorial	285.97***
		Graphemic	266.30***
		Unrelated	79.76*
		Unrelated Pictorial	

Note. Standard Error of Estimate is 35.89 s in each case.

* $p < .05$ ** $p < .01$ *** $p < .001$.

Appendix E - Word List 1 and Word List 2

Word List 1	Word List 2	Association Strength
BABY	CRIB	High
BATH	TUBE	Low
BLUE	BIRD	High
CARS	BUSY	Low
TOWN	CITY	High
COLD	DAMP	Low
COME	CAME	High
BARK	DARK	Low
HOLE	DEEP	High
BOYS	DOGS	Low
FIND	LOSE	High
CORN	FOOT	Low
FROM	AWAY	High
GIRL	THIN	Low
GUNS	FIRE	High
REST	HAND	Low
ROCK	HARD	High
COKE	HAVE	Low
HEAD	HAIR	High
EARS	HERE	Low

TALL	HIGH	High
FEET	JUMP	Low
KING	RULE	High
WOOL	LAMP	Low
DROP	LIFT	High
DUCK	LION	Low
LIVE	LIFE	High
HOUR	LONG	Low
LOUD	BANG	High
MAKE	ACHE	Low
MOON	STAR	High
ONLY	OPEN	Low
FOOD	SALT	High
SELL	FELL	Low
SLOW	FAST	High
COZY	SOFT	Low
MILK	SOUR	High
VINE	STEM	Low
TAKE	GIVE	High
WORD	TELL	Low
THAT	BOOK	High
THEN	WERE	Low
MUST	THEY	Low

THIS	NAME	Low
VERY	GOOD	High
TIME	WHAT	Low
WANT	WISH	High
TOOK	WITH	Low

Note. The stimulus words and their associates selected from *Word Association Norms: Grade School Through College* (Palermo & Jenkins, 1964).

Word Test List

Name: ______________________________

Subject number: ______________________

Please place a checkmark next to every word that you remember hearing in either ear.

ACHE	
AWAY	
BABY	
BANG	
BANK	
BARK	
BATH	
BIRD	
BLUE	
BOAT	
BOOK	
BOYS	
BUSY	
CAKE	
CAME	

CARS	
CITY	
COKE	
COLD	
COME	
COOL	
CORN	
COZY	
CRIB	
DAMP	
DARK	
DEEP	
DOGS	
DROP	
DUCK	
DUST	
EARS	
FAKE	
FAST	
FEET	
FELL	
FIND	

FIRE	
FOOD	
FOOL	
FOOT	
FROM	
GIRL	
GIVE	
GOOD	
GUNS	
HAIR	
HAND	
HARD	
HAVE	
HAZE	
HEAD	
HERE	
HIGH	
HOLE	
HOUR	
JUMP	
KING	
LADY	

LAMP	
LAZY	
LEFT	
LIFE	
LIFT	
LION	
LIVE	
LONG	
LOSE	
LOUD	
LUST	
MAKE	
MILK	
MOON	
MOVE	
MUST	
NAME	
NEWS	
ONLY	
OPEN	
POST	
RANT	

REST	
ROCK	
RULE	
SALT	
SELL	
SLOW	
SOFT	
SORE	
SOUP	
SOUR	
STAR	
STEM	
TAKE	
TALL	
TELL	
TENT	
THAT	
THEN	
THEY	
THIN	
THIS	
TIME	

TOOK	
TOOL	
TOWN	
TUBE	
VERY	
VINE	
WANT	
WERE	
WHAT	
WISH	
WITH	
WOOL	
WORD	

Appendix F – Prose 1 and Prose 2

Prose 1	Prose 2	Association
KING	RING	Low
ROAR	LION	High
WHAT	WITH	High
HEAD	BALL	Low
FROM	WORD	Low
LOUD	NOSE	Low
THIS	THAT	High
MAKE	WISH	Low
ROAD	LONG	High
HARD	SOFT	High

Note. The stimulus words and their associates selected from *Word Association Norms: Grade School Through College* (Palermo & Jenkins, 1964).

Appendix G – Prose Passage 1 and Prose Passage 2

Prose Passage 1

The KING thought that the ROAR of the crowd was WHAT he heard. Then he walked around a little, scratching his HEAD as he pondered the idea. FROM where he stood he could see the city clearly. The noises that he heard were quite LOUD, and THIS made him think that the populace was up to something. He had to MAKE a better plan he thought. He realized that a troublesome ROAD lay ahead, and that he would have to make many HARD decisions, even some that he might regret.

Prose Passage 2

The RING fell as the LION pursued the little boy WITH the yellow bag. As the little boy continued running, the BALL fell on the ground, spreading WORD among the people that danger was imminent. The animal found food simply by relying on its NOSE, and THAT was a blessing for the people. They hid their food and made a WISH for better times. Then, the frightened boy looked for the LONG, dark alley along which he had walked that night, taking SOFT steps so as not to attract attention.

Appendix H – Prose Test

Name: ______________________________

Subject number: ______________________

Please place a checkmark next to every word that you remember hearing in either ear.

BALL	
BOMB	
CUTE	
FROM	
HARD	
HEAD	
KING	
LION	
LONG	
LOUD	
MAKE	
MIST	
NOSE	
NOUN	

PINK	
RING	
ROAD	
ROAR	
SICK	
SINK	
SOFT	
SORT	
TALE	
TASK	
THAT	
THIS	
WHAT	
WISH	
WITH	
WORD	

Appendix I – Color Stimuli and Their Corresponding Specifications Used in the Red-Yellow Color Task

Color specification (Munsell)	Color name (Photoshop)	Color specifications (Photoshop)
R 6 10	RGB Red*	R: 100 G: 0 B: 0
R 5 10	CMYK Red*	C :0 M: 100 Y: 100 K: 0
R 7 4	Pastel Red	C :0 M: 50 Y: 50 K: 0
R 6 8	Light Red	C :0 M: 72 Y: 72 K: 0
R 5 6	Dark Red	C :0 M: 100 Y: 100 K: 0
R 5 4	Darker Red	C :0 M: 100 Y: 100 K: 40
YR 4 4	Pastel Red Orange	C :0 M: 100 Y: 100 K: 60
YR 7 10	Light Red Orange	C :0 M: 38 Y: 50 K: 0
YR 6 12	Pure Red Orange	C :0 M: 100 Y: 100 K: 0
YR 5 10	Dark Red Orange	C :0 M: 54 Y: 72 K: 0
YR 4 8	Darker Red Orange	C :0 M: 75 Y: 100 K: 0
Y 8 10	RGB Yellow*	R: 255 G: 255 B: 0
Y 8 12	CMYK Yellow*	C :0 M: 25 Y: 50 K: 0
YR 6 4	Pastel Yellow Orange	C :0 M: 0 Y: 100 K: 0
YR 7 6	Light Yellow Orange	C :0 M: 36 Y: 72 K: 0
YR 6 8	Pure Yellow Orange	C :0 M: 50 Y: 100 K: 0
YR 5 2	Dark Yellow Orange	C :0 M: 50 Y: 100 K: 40
YR 4 2	Darker Yellow Orange	C :0 M: 50 Y: 100 K: 60

Y 8 6	Pastel Yellow	C :0 M: 0 Y: 50 K: 0
Y 8 8	Light Yellow	C :0 M: 0 Y: 72 K: 0
Y 7 6	Dark Yellow	C :0 M: 0 Y: 100 K: 40
Y 5 6	Darker Yellow	C :0 M: 0 Y: 100 K: 60

Note. In Munsell notation, letters indicate hue (R = red; Y = yellow; YR = yellow-red), first number indicates value, and the second number indicates chroma. Unambiguous stimuli are indicated by *.

Appendix J – Color Stimuli and Their Corresponding Specifications Used in the Blue-Green Color Task

Color Specification (Munsell)	Color Name (Photoshop)	Color Specifications (Photoshop)
G 7 6	RGB Green*	R: 0 G: 100 B: 0
G 6	CMYK Green*	C: 100 M: 0 Y: 100 K: 0
G 7 7	Pastel Green	C: 50 M: 0 Y: 50 K: 0
G 6 4	Light Green	C: 72 M: 0 Y: 72 K: 0
G 5 6	Dark Green	C: 100 M: 0 Y: 100 K: 40
G 5 8	Darker Green	C: 100 M: 0 Y: 100 K: 60
BG 8 2	Pastel Green Cyan	C: 50 M: 0 Y: 25 K: 0
BG 6 6	Light Green Cyan	C: 72 M: 0 Y: 36 K: 0
BG 5 6	Pure Green Cyan	C: 100 M: 0 Y: 50 K: 0
BG 4 6	Dark Green Cyan	C: 100 M: 0 Y: 50 K: 40
BG 3 6	Darker Green Cyan	C: 100 M: 0 Y: 50 K: 60
B 4 6	RGB Blue*	R: 0 G: 0 B: 255
B 5 6	CMYK Blue*	C: 100 M: 100 Y: 0 K: 0
PB 7 6	Pastel Cyan Blue	C: 50 M: 25 Y: 0 K: 0
PB 6 6	Light Cyan Blue	C: 72 M: 36 Y: 0 K: 0
PB 5 6	Pure Cyan Blue	C: 100 M: 50 Y: 0 K: 0
PB 5 10	Dark Cyan Blue	C: 100 M: 50 Y: 0 K: 40
PB 4 6	Darker Cyan Blue	C: 100 M: 50 Y: 0 K: 60

PB 6 8	Pastel Blue	C: 50 M: 38 Y: 0 K: 0
PB 5 10	Light Blue	C: 72 M: 54 Y: 0 K: 0
PB 4 10	Dark Blue	C: 100 M: 75 Y: 0 K: 40
PB 3 8	Darker Blue	C: 100 M: 75 Y: 0 K: 60

Note. In Munsell notation, letters indicate hue (B = blue; BG = blue-green; G = green; PB = purple-blue), first number indicates value, and the second number indicates chroma. Unambiguous stimuli are indicated by *.

BIOGRAPHY OF THE AUTHOR

Oshin Vartanian was born in Iran on October 20th, 1970. He began to study psychology at the University of Amsterdam, and completed his B.Sc. at the University of British Columbia in Vancouver, BC. He will begin a postdoctoral fellowship at York University in September 2002. He considers Dr. Peter Suedfeld, Dr. Jerry Wiggins, and Dr. Colin Martindale to have been his most important mentors. Oshin is a candidate for The Doctor of Philosophy degree in Psychology from The University of Maine in August, 2002.