

## THE RELATIONSHIP BETWEEN ANXIETY AND COGNITIVE STYLE MEASURED ON THE STROOP TEST

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This study examines the relationship between anxiety and cognitive style, as measured on the Stroop Color-Word Test. A sample of 253 respondents, selected on the basis of their anxiety scores, were administered the Stroop Test and Kuwait University Anxiety Scale (KUAS). The subjects were divided into two groups, the most and the least anxious, depending upon their anxiety scores on the KUAS. The results showed no significant difference between the most and least anxious groups in cognitive style, indicating increased interference in both groups. These findings suggest the susceptibility of both groups to constricted cognitive style, and their propensity to interference effects on the Stroop test.

Cognitive approaches to personality are found to be associated with several common characteristics, such as individual differences in thinking styles, emphasis of style over content, assumption that cognitive styles are related to personality traits, and treatment of cognitive styles as traits. The impact of characteristics has been found to be independent of situational influences, which emphasize style consistency (Brody, 1972).

Extensive research in the field of *cognitive styles* has led to several theories during the past 45 years which link perception to personality and explain the

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relationship between stimuli and associated response patterns. Thus, *cognitive style* is a person's typical or habitual mode of problem-solving, thinking, perceiving, and remembering (Allport, 1937), whereas another study defines cognitive style as *the way an individual filters and processes stimuli depending upon his or her environment* (Harvey, 1963). Cognitive style has also been viewed as *consistent patterns of "organizing and processing information"* (Messick, 1976), while yet another study considers cognitive style as *the arrangement of a number of cognitive controls within a personality* (Gardner, Hoizman, Klein, Linton, & Spence, 1959). These divergent theories of cognitive style emphasize structure rather than content, where structure refers to how cognition is organized, and content indicates the available knowledge. Our study uses the term *cognitive style* to refer to structure, which implies behavioral consistency.

Briefly, cognitive styles refer to the preferred way in which the information is processed, regardless of the individual differences in abilities, such as peak performance, or styles, which tend to describe an individual's characteristic mode of thinking, remembering or problem solving (Gardner, 1953). Styles also have bipolar dimensions, whereas abilities are unipolar. Hence, having more ability is usually considered beneficial, while having a particular cognitive style simply denotes a tendency to behave in a certain manner. For all practical purposes, *cognitive style* is usually described as *a personality dimension influencing attitudes, values and social interaction* (Within & Goodenough, 1981).

Although some 19 cognitive styles have been defined in the literature (Messick, 1976), none has been investigated as thoroughly as in the study on the perceptual construct of field independence (Witkin, 1949), and the studies on constricted flexible cognitive control (Gardner, 1953; Klein, 1954). Our study attempts to examine further the relationship of anxiety to constricted-flexible cognitive style.

The concept of the constricted-flexible cognitive style measured by the Stroop Color-Word Test was first introduced 50 years ago in a study (Smith & Klein, 1953), which exposed the subjects to the color-naming experiment in a clinical setting. The test measured the subjects' behavior in reaction to color cards on which color words were printed in nonmatching colored inks. The study found that when subjects were asked to name the ink color, rather than to read the word, the time they took to complete the card was almost 50% more than the time taken to name ink colors printed as rectangles. This increase in color-naming time was referred to as the *Color-Word interference effect*. Another study focuses on "the basic ability tapped by Stroop in selecting relevant information from one's environment in a flexible manner" (Golden, 1978). This study further points out that a person with a flexible cognitive style was relatively resistant to interference effects measured on the Stroop Test, despite his/her ability to respond in a

flexible manner without being overwhelmed by a dominant stimulus field. This showed that individuals with a constricted cognitive style were prone to interference effects on the Stroop Test, and avoided using feelings or emotional reactions as information sources, while remaining resistant to change in three cognitive sets, indicating a constriction in ability to use all available cues. It is also suggested that the Stroop stimulus primarily concerned an individual's ability to sort information from the environment, and his/her selective response to it (Klein, 1964).

The Stroop phenomenon has been explained by two contrasting approaches, *perceptual conflict* and *response competition*. The former refers to *a proposed overloading of an individual's limited processing capacity by word and incongruent color, involving both relevant (color) and irrelevant (word) information*, thus causing delay in total processing time. The latter concerns the *response initiation stage, where two competing responses use a single response channel*. While a color stimulus requires transformation from a perceptual to a verbal code, such transformation is not required for word stimulus. Hence, irrelevant word information reaches the response initiation stage before the relevant color information, causing interference apparent in the Stroop task (Doehrmann, Landau, & O'Connell, 1978). Both views have received substantial empirical support (Doehrmann et al., 1978; Wheeler, 1977; Williams, 1977).

Anxiety invariably is an inhibiting factor in learning which receives wide attention due to its close relationship to arousal emotions, attention and motivation (Clark & Fiske, 1982; Mandler, 1984). Usually situations that demand decision or judgment – for example, tests and examinations – are common precursors of anxiety and impair performance in a wide range of cognitive functions, including attention, memory, concept formation and problem solving. Invariably, whenever an interaction involves task difficulty anxiety results in poorer performance, especially in complex tasks. This is explained in terms of the drive reduction theory, according to which the arousal increases the response strength with the activation of competing responses in complex tasks (Hull, 1943). However, in terms of cognitive symptoms, anxiety strongly influences attention, according to which one's focus is directed to the danger at hand (e.g., panic disorder, performance anxiety). As regards memory retrieval, anxiety creates a significant blocking of nonthreat-related information, delimiting an individual's perception of anxiety. Hence, one's thoughts and mental images tend to be catastrophic, due to an exaggerated sense of situational danger, and simultaneous underestimation of one's ability to control it (Robert, 1995).

Looking at it from the cognitive standpoint, most researchers tend to view anxiety as a trait, a relatively stable personality characteristic that prompts an individual to react to threatening situations, sometimes with debilitating psychological, physiological, and behavioral response patterns (Hancock, 2001).

Among these, the psychological effects on memory have received considerable attention, associating anxiety with cognitive interference on a wide range of cognitive tasks (MacLeod, 1996). Highly anxious individuals have thus been shown to report more intrusive thoughts and lower test performance, as compared to less anxious individuals (Blankstein, Toner, & Flett, 1989). Similarly, high test-anxious individuals have consistently scored lower in tests of free (uncued) memory recall of material (Hembree, 1988).

Referring to existing literature on the Stroop Test and anxiety, Jensen's (1965) study related the Stroop to Weiss and Sherman's 1962 study which reportedly found a significant correlation between the Manifest Anxiety Scale and Stroop interference in chronic schizophrenics' neuroticism, which – though small – was ( $p > 0.11$ ) for color score, and ( $p > 0.01$ ) for color-word score level. However, according to the findings of another study, there appeared to be no such significant relationship between neuroticism and the Stroop Test (Alpers, 1968).

As regards gender and performance, a study does report significant correlation between men's and women's performance in Stroop interference (Sarmany, 1977), in terms of some personality variables on Cattell's 16PF scale (Conn & Rieke, 1994), with men showing a significant positive correlation  $r = 0.47$  ( $p > .01$ ) with factor C (emotional maturity). Another study (Helode, 1982) reported the inventory and modification of the Stroop Color-Word Test (MCWT), examining the relationship between neuroticism and the Stroop interference effect, showing neuroticism positively correlating to the Stroop interference effect. Higher levels of anxiety associated with selective processing of threat - related material, likewise showed that as anxiety increased, a corresponding increase in time was needed to name the ink color of threat-related words in a Stroop task (Martin, 1990).

Another study conducted on a group of patients found that interference occurred for positive stimuli in psychiatric patients with generalized anxiety disorder, with the authors speculating that these results occurred when positive stimuli were antonyms, or near antonyms, of negative stimuli, thus downplaying the significance of the emotionality hypothesis by suggesting that threat played a critical role in the Emotional Stroop effect (Martin, Williams, & Clark, 1991).

However, a study using undergraduate students as subjects, examined the relationship between the Stroop Test and anxiety state. Among 72 undergraduates, aged 18-30 years, wherein a significant positive correlation was found between Stroop color-naming impairments and level of anxiety state (Green, Rogers, & Hedderley, 1996). Another study found that anxiety state increased following a computer version of the Stroop Color-Word Interference Test and a nonconflicting control task involving color naming of color patches among 48 male subjects aged 18.1-29.5 yrs (Renaud & Blondin, 1997), while a

later study (Stewart, Conrod, Michelle, & Pihl, 1997), found high-anxiety – sensitive college students (20 males and 20 females) demonstrating more threat-related interference in the Stroop color-naming task than did low anxiety sensitive subjects. In a more recent study (Jones, Stacey, & Martin, 2002), a person’s emotional state, such as anxiety, was found to influence the color naming in the emotional Stroop task, with higher levels of anxiety associated with significant interference in color naming. The study also found that subjects with a high anxiety trait took relatively longer in identifying anxiety-related color, compared to matching neutral words for a blocked-trial presentation.

These studies tend to reveal different dimensions of anxiety and cognitive style, based on the Stroop Color-Word Test, for determining anxiety as a type of personality function.

Though some results do explain the relationship between anxiety and cognitive style, there appears to be a critical need for more studies to arrive at well-founded conclusions explaining the cognitive processes involved in anxiety and, more specifically, its relationship with cognitive style as derived from the Stroop Color-Word Test, as a measure of anxiety and personality function.

Given this need, the present study examined:

1. A significant group difference on the Stroop Tests, where the most anxious group is expected to have a greater latency and greater interference by distracting stimuli than the least anxious group, and
2. To determine whether a significant correlation exists between anxiety and the Stroop Test.

While referring to existing research in the field, some studies do substantiate the relationship between Stroop performance and interference (Green et al., 1996; Helode, 1982; Jones et al., 2002; Martin, 1990; Renaud & Blondin, 1997; Sarmany, 1977; Stewart et al., 1997) while some others do not find any relationship between anxiety and Stroop (Alperson, 1968; Jensen, 1965; Martin et al., 1991). These studies have invariably used different anxiety scales on different subjects, leading to inconsistent results using different samples and different anxiety scales. Our study makes an attempt to further contribute in advancing knowledge on the relationship between anxiety and cognitive style measured on the Stroop Test.

## METHOD

### SAMPLE

The study was conducted with a sample of 253 undergraduate students at Kuwait University, selected from a pool of students, based on their anxiety scores. The selected students received additional credit for their participation in the experiment, described as the study of perception. Overall, there were 178 females and 75 males in the age range of 18 to 22 years. The selection was based

on administering the Kuwait University Anxiety Scale (KUAS) to 632 students (278 males and 354 females), from which the sample of 253 students ultimately formed our study group.

## MATERIALS

Anxiety was assessed on the basis of the Kuwait University Anxiety Scale, (Abdel-Khalek, 2000). The scale comprises 20 brief statements, on a 4-point intensity scale, ranging from *Rarely* (1) to *Always* (4). Factor analysis yielded three high-loaded factors of Cognitive/ Affective, Behavioral/Subjective, and Somatic/Anxiety, with moderate interfactor correlations, ranging from .27 to .74. Reliabilities ranged from .88 to .92 (alpha) and between .70 to .93 (test-retest), denoting good internal consistency and stability. Criterion-related validity of the scale ranged between .70 and .88 (5 criteria), while the loadings of the scale on a general factor of anxiety were .93 and .95 in two-factor analyses, demonstrating the scale as criterion-related and with factorial validity. Kuwaiti norms were reported ( $N=4,660$ ). An English version of the scale is also available.

Constricted-flexible cognitive style was assessed by the Stroop Color-Word Test. The version of the Stroop Test employed here was the second Stroop version (Golden, 1978).

The tests comprised three pages. Each page had 100 items, presented in 5 columns of 20 items each.

Page 1 (Word) consisted of the words "RED", "GREEN" and "BLUE", arranged randomly, and printed in black ink on white 8.5"x11" paper. Care was taken to ensure that no word followed itself within a column.

Page 2 (Color) consisted of 100 items, all written as "XXXX", printed in either red, green or blue ink. No color followed itself in a column, nor did it match the corresponding item on Page 1. (For example, if the thirteenth item on Page 1 was RED, the thirteenth item on Page 2 could not be printed in red ink).

Page 3 (Color-Word) consisted of the words on Page 1 printed in the colors on Page 2. The two pages were blended item for item: item 1 on page 1 was printed in the color used in item 1 on page 2 to produce item 1 on page 3. Care was taken to ensure that in no case did the word and the printed color-match. Higher scores reflected greater constricted cognitive style and greater interference, while lower scores reflected flexible cognitive style and less interference.

## PROCEDURE

The subjects completed the experimental procedure in two different sessions, within a three-weeks' time interval. They were informed that the purpose of this evaluation was purely research, without mentioning the purpose of the questionnaire, in order to restrict the effect of social desirability and to control for response biases.

The KUAS of 20 items was administered to each subject in a group session. On

completing the questionnaire, the subjects were asked whether they were color blind, dyslexic or had ever taken the Stroop Test before. None answered "Yes" to any of these questions. They were also informed that they would be required to participate in another 10-minute experiment.

All subjects were divided into two groups, depending upon their scores on the anxiety scale. Subjects with scores 50 to 71, were considered the most anxious ( $n=127$ ), and those with scores of 20 to 30 were the least anxious ( $n=126$ ).

In the second session, the Stroop Test was administered verbally in English, in a small, quiet room in the Psychology Department, with the subjects given Arabic instructions, as needed, based on the original English instructions.

The examiner administering the Stroop Test was unaware of the subjects' anxiety score. Each participant received an additional credit for participating in the experiment.

### DATA ANALYSIS

The data were analyzed using SPSS (*Statistical Package for the Social Sciences*) V.11, and the relationship between anxiety and cognitive style measured by the Stroop Test, was tested by correlation analysis. A *t*-test was applied to determine the most and least anxious subjects.

## RESULTS

Comparison of the means and standard deviations in the most and least anxious groups of subjects on cognitive style was made by the Stroop Test. *F* and *t*-test scores for the most and least anxious groups on cognitive style were measured on the basis of the respondents' scores on the KUAS (Table 1).

**TABLE 1**  
COMPARISONS OF MEANS OF THE MOST AND LEAST ANXIOUS GROUPS BASED ON ANXIETY SCALE AND COGNITIVE STYLE VARIABLES

Variable	Most Anxious <i>n</i> =127		Least Anxious <i>n</i> =126		<i>T</i> Value	<i>P</i> Level
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
W	52.32	11.67	51.68	6.05	0.54	.59
C	57.19	12.33	55.40	5.26	1.46	.145
CW	54.10	7.39	53.28	6.69	0.98	.330
C+W	109.51	21.73	107.09	10.34	1.13	.269
W+C+CW	163.61	24.91	160.37	14.72	1.24	-.217
CW/C	0.96	0.14	0.97	0.96	0.30	-.763
CW-C	3.08	12.92	2.12	5.30	0.76	.451
C+CW/2	84.24	13.62	82.04	7.19	1.57	-.118
KUAS	55	6.39	27	3.09	42.71	.001

W=Stroop Word; C=Stroop Color; C.W= Stroop Color Word; KUAS=Kuwait University Anxiety Scale

The relationship between anxiety and cognitive style, and the correlations of eight cognitive style variables among the two groups, were computed to determine the most and the least anxious groups. Mean scores for the most anxious group for anxiety and cognitive style variables were found to be higher in comparison to those who were least anxious (Table 2). Though these differences were not found to be statistically significant, KUAS scores for most anxious group were significantly higher ( $p < 0.001$ ) when compared to those of the least anxious group.

**TABLE 2**  
CORRELATION BETWEEN MOST AND LEAST ANXIOUS GROUPS BASED ON ANXIETY SCALE AND COGNITIVE STYLE VARIABLES

Variable	Most Anxious	Least Anxious
	<i>n</i> =127	<i>n</i> =126
	<i>r</i>	<i>r</i>
W	.08	.10
C	.10	.07
CW	.11	.06
C+W	.10	.10
W+C+CW	.12	.09
CW/C	.09	.01
CW-C	.04	.01
C+CW/2	.13	.08
KUAS	-	-

*r*=Correlation, W=Stroop Word, C=Stroop Color, CW= Stroop Color Word, KUAS=Kuwait University Anxiety Scale

In general, the relationship between anxiety and cognitive style variables both in terms of *t*-test of group means and test of correlation, was not statistically significant between the most and least anxious groups. These results suggest increased interference in both groups, thus, replicating the previous research findings (Alperson, 1968; Jensen, 1965; Martin et al., 1991), and showing that both groups, the most anxious and least anxious, exhibited a constricted cognitive style, as measured on the Stroop Test.

## DISCUSSION

The cognitive style dimensions of personality functioning present a new set of methods for assessing personality organization. The present study attempted to link the information from the cognitive approach with that derived from the personality approach, to facilitate greater theoretical implication. The prime aim of the study was thus to examine the relationship between cognitive style and the personality correlates of anxiety. The results indicate a poor relationship between

anxiety and cognitive style as measured by the Stroop Test, suggesting our inability to predict anxiety on a measure of cognitive style. Moreover, the results of the constricted-flexible cognitive style, derived from the Stroop Color-Word (interference) Test with anxiety, indicated that the most and the least anxious groups manifested high interference and constricted cognitive style. Interestingly, our results do not support the prevalent notion that anxious people manifest high interference on the Stroop Test, compared to those who are not anxious. Hence, our results do not replicate the findings of the previous research (Green et al., 1996; Helode, 1982; Jones et al., 2002; Martin, 1990; Renaud & Blondin, 1997; Sarmany, 1977; Stewart et al., 1997). Also, our results are not consistent with the drive reduction theory (Hull, 1943), which hypothesizes that anxiety results in poor performance in a complex task.

Our results also do not support an earlier theory (MacLeod, 1996), which postulates the association of anxiety with cognitive interference, for example, more intrusive thoughts and lower task performance (Blankstein et al., 1989)

Further, the distinction between the most anxious and the least anxious groups was not found to be statistically significant across the Stroop Test variables. It is not clear why this finding has not been given much respect or attention in the investigation of anxiety differences on Stroop performance. This is not to say that the anxious subjects show more or less cognitive interference than do the not anxious subjects. The question remains why masked Stroop effects were absent in anxiety. It is possible that anxiety state trait interaction is necessary for subliminal effects to occur.

It may be pertinent to mention here that the researcher's conclusions are based upon a single interference score, such as CW, a single Stroop Test in a single test administration, a single cognitive style measure, and a single population, and could be misleading. It might be necessary to conduct further research by taking into account this limitation, as a new direction in methodology for future research.

Certainly, the relationship between personality and perceptual cognitive styles is not a simple one. The results from the present study provide a promising beginning for the cross-cultural examination of the relationship between anxiety and cognitive styles. Together, these results are suggestive of a more complex relationship between anxiety as a function of personality trait with the cognitive styles. It is expected that future studies could fruitfully overcome some of the limitations of the present study by using larger sampling procedures, selecting a group of extremely anxious subjects from a clinical sample, an extremely nonanxious group of subjects from a clinical sample, and an extremely nonanxious group of subjects from a nonclinical sample, and administering a set of cognitive style measures, preferably in a minimum of three testing sessions.

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