



## SUBCLINICAL MANIFESTATIONS OF PSYCHOSIS-PRONENESS, EGO STRENGTH, AND CREATIVITY

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**Summary**—A study was conducted to examine the joint influence of psychosis-proneness and ego strength on creativity in college students. Psychosis-proneness and ego strength were defined psychometrically by means of Minnesota Multiphasic Personality Inventory and California Psychological Inventory profile, a procedure that resulted in creation of four categories of research subjects: (1) psychosis-prone/high ego strength, (2) psychosis-prone/low ego strength, (3) not psychosis-prone/high ego strength, and (4) not psychosis-prone/low ego strength. As predicted, psychosis-prone persons who were high in ego strength exhibited the highest level of evaluated creativity in their proposed solutions to an engineering problem and also the highest scores on the Remote Associates Test.

### INTRODUCTION

Several theories and empirical studies implicate inclinations toward psychoticism as possibly conducive to creativity (Andreasen, 1987; Andreasen & Canter, 1974; Andreasen & Powers, 1975; Barron, 1969, 1972; Dykes & McGhie, 1976; Eysenck, 1983, 1993; Jamison, 1989, 1990; Jarvik & Chadwick, 1973; MacKinnon, 1961; Prentky, 1980; Rawlings, 1985; Richards, 1981; Richards, Kinney, Lunde, Benet & Merzel, 1988; Rushton, 1990; Schuldberg, 1990; Woody & Claridge, 1977). Eysenck (1993) observes that some people are overinclusive in their thinking, perceiving a large sample of ideas as relevant to a problem under consideration, whereas other people maintain a relatively narrow, more conventional cognitive style. It is the overinclusive cognitive style, Eysenck believes, that constitutes the basis for creativity and is also characteristic of people who are psychotically inclined but not actually psychotic. Dykes and McGhie (1976) provide empirical support for Eysenck's theory. They examined the attentional strategies that highly creative and schizophrenic persons each employed. A modified version of the Wallach and Kogan tests of divergent thinking served as their measure of creative thinking. Evidence from the Lovibond Object Sorting Test suggested that both creative and schizophrenic persons, by comparison with the general population, use attentional strategies that sample a wide range of environmental input. Andreasen and Powers (1975) likewise found that highly creative writers were overinclusive on a task designed to measure overinclusion in schizophrenia.

Woody and Claridge (1977) studied a university student population who completed the Eysenck Personality Questionnaire and the Wallach–Kogan creativity tests. The intent was to obtain evidence for a relationship between psychoticism as a personality dimension in normal individuals and creativity. All of the creativity measures showed significant positive correlations with the Psychoticism scale of the Eysenck Personality Questionnaire but not with the Neuroticism scale. Rawlings (1985) later provided some replication of these findings.

Another investigation that is especially pertinent to Eysenck's theory is one by Rushton (1990). Scholars have advocated use of citation indexes as a means to determine creativity in science, mathematics, and psychology (Albert, 1975; Cole & Cole, 1967; Garfield, 1970; Myers, 1970). Rushton designed a rating scale that contained items which denoted psychoticism as defined by Eysenck and Eysenck (1985). He sent various scale items to H. J. Eysenck with the request that he assign scale values to indicate the degree to which the items reflected Eysenck's definition of psychoticism. Ratings on the resulting scale both by self and peers disclosed positive correlations between academic psychologists' psychoticism scores and the frequency with which others cited their work.

From an earlier investigation, Barron (1969) concluded that creative persons simultaneously were both sicker and healthier than people in general. Studying writers and architects whom professors in those fields had nominated as creative, Barron found that creative persons scored high on dimensions of the Minnesota Multiphasic Personality Inventory (MMPI) on which psychotic persons likewise score high. The Ego-strength scale of the MMPI correlates negatively with these scales in the general population. Creative persons in Barron's study, however, scored high on the Ego-strength scale of the MMPI, as they did on many ego-strength dimensions of the California Psychological Inventory (CPI). Unlike the truly psychotic person who scores low on ego-strength variables, the picture that emerges of creative individuals from the Barron study is one of persons who have the resources necessary to cope effectively with psychological difficulty and perhaps even to harness and guide it toward purposeful ends.

The present study examined creativity in relation to psychosis-proneness as determined by the MMPI (principally high Sc scores) and ego strength as assessed by the CPI (high scores on the Tolerance, Achievement via Independence, and Flexibility scales). A domain of creativity was examined that previous studies of the psychosis-prone individual have not considered, namely, engineering design. A second dependent measure, one that evaluates Ss' capacity to summon remote associations, or engage in overinclusive thinking, was the Remote Associates Test (Mednick & Mednick, 1967). Four categories of persons were defined psychometrically: (1) psychosis-prone, high ego strength, (2) psychosis-prone, low ego strength, (3) not psychosis-prone, high ego strength, and (4) not psychosis-prone, low ego strength. The prediction was that psychosis-prone persons high in ego strength would exhibit the highest level of evaluated creativity in their solutions to the engineering problem and also would receive the highest scores on the Remote Associates Test. These hypotheses rest on an assumption that Person (1986) and Schulberg (1990) propose as reasonable, namely, that both creativity and psychopathological traits may be regarded as continuous rather than discrete behavioral categories whose interrelationship one may study in ordinary, nonclinical populations.

## METHOD

### *The Minnesota Multiphasic Personality Inventory (MMPI)*

No psychometric instrument has received greater attention than the MMPI. Some controversy has surrounded its use and interpretation, but evidence for its construct validity well recommends it as an instrument for assessing proneness to various forms of psychopathology (King, 1978; Lanyon & Goldstein, 1982).

The MMPI yields scores on eight scales that imply some manner of psychopathology, a social introversion scale, a masculinity-femininity scale, and two scales that connote attempts at dissimulation. Scale scores are not specifically diagnostic but merely suggestive of particular psychopathological inclinations. Scale scores appear as *T* scores ( $M = 50$ ,  $SD = 10$ ) that express a person's position in relation to the general population. The important question is: How can one conceptually capture subclinical manifestations of psychosis-proneness through use of the MMPI? The logic of the instrument and scholarly discussions of psychotic symptomatology (e.g. Davison & Neale, 1990; Schneider, 1959) suggest that one reasonably might regard a *T* score of 60 on the Schizophrenia (Sc) scale as pointing toward psychosis-proneness. I propose that a *S* who scores 60 on the Paranoia (Pa) scale likewise be so regarded if the person also receives a *T* score of at least 55 on the Sc scale.

In those instances in which it occurs, the paranoia aspect of psychosis-proneness may assist creative endeavor by making individuals hypervigilant to environmental stimuli and keenly sensitive to the as-yet-unforeseen (Jarvik & Chadwick, 1973). Such persons may anticipate criticism of their endeavors and mentally reach beyond their current efforts to come up with solutions that anticipate and meet potential criticisms. Viewed in this way, some degree of paranoia may motivate people to seek more remote associations to the ideas they are contemplating. Paranoid aspects of personality often characterize both schizophrenia and the affective disorders (Davison & Neale, 1990; Goodwin & Jamison, 1990).

The basis for assigning greater weight to the Sc than the Pa scale in this operational definition is that the Sc scale includes more of the traits to which writers refer when discussing psychosis-proneness

than does the Pa scale. Ss who are not psychosis-prone, by this reasoning, are those who obtain *T* scores of 50 or below both on the Sc and Pa scales. The intent was to develop a broadly inclusive psychometric classificatory scheme that encompasses persons of the kind the literature on creativity regards as psychosis-prone, without expecting the definition to include only persons who specifically exhibit traces of schizophrenic symptomatology.

#### *The California Psychological Inventory (CPI)*

Development of the CPI proceeded along lines similar to the MMPI but with reference to normal rather than psychiatric populations. Most experts agree that the CPI is one of the best personality inventories in use today with good evidence for its validity (Anastasi, 1976; Kleinmutz, 1982).

Factor analysis of the CPI disclosed four factors (Gough, 1987). One of these corresponds closely with what psychologists commonly mean by the term ego strength (Colligan & Offord, 1987) and has the largest loadings on the scales for Tolerance, Achievement via Independence, and Flexibility. Ss who obtained average *T* scores of 55 across these three scales qualified as high in ego strength for present research purposes, and those with *T* scores of 45 or less as low in ego strength. The decision was to make a *T* score of 45 or less the basis for categorizing a *S* as low in ego strength, because 45 or less denotes a *low* position in relation to the general population rather than merely an *absence* of high ego strength. *T* scores of 50 or less on the Sc and Pa scales of the MMPI were the chosen standard for categorizing Ss as showing an absence of psychotic symptomatology because relative *absence* of symptomatology rather than a distinctly *low* position on these dimensions was the conceptual standard desired.

#### *Remote Associates Test (RAT)*

Mednick (1962) formulated a theory of creativity in which he proposes that the essence of the creative process is the ability to bring together highly disparate cognitive elements to form unusual but useful combinations. Mednick and Mednick (1967) designed a test, the Remote Associates Test (RAT), to measure this ability. Each item consists of three words followed by a blank. Instructions to Ss are that they provide, in the blank space, a word that relates to each of the three words in the item. There is evidence to support both the predictive and construct validity of the RAT (Isen, Daubman & Nowicki, 1987; Mednick, M. T., 1963; Mednick, S. A., 1962; Mednick & Mednick, 1967; Mendelsohn, 1976; Mendelsohn & Covington, 1972). In reviewing attempts to design a basic test of creativity, Dacey (1989) concludes that the RAT is the only such attempt that has met the psychometric criteria of success.

The principal reason for selecting the RAT for the present study over competing instruments is that it measures a cognitive process which theory (Eysenck, 1993) and previous research (Dykes & McGhie, 1976; Andreasen & Powers, 1975) implicates as a possible link between psychotic inclination of personality and creativity, namely, overinclusiveness in thinking.

#### *Subjects*

Men and women enrolled in introductory psychology classes at Clarkson University served as research Ss for the present investigation. They completed the CPI evenings in groups of 10–20 students. Approximately 60% qualified as high or low in ego strength and therefore received a request to come back a second time to complete the first 365 items of the MMPI, again in small groups of 10–20. (The first 365 items of the MMPI include all items that define the 10 principal scales.) Approximately 40% of the latter students qualified either as psychosis-prone or as not psychosis-prone. Two semesters of testing in this manner yielded the requisite 24 students in each of the four conditions: psychosis-prone/high ego strength, psychosis-prone/low ego strength, not psychosis-prone/high ego strength, and not psychosis-prone/low ego strength. These people were the ones invited to the laboratory to do the RAT and a problem in engineering design. Clarkson is a technological university with males exceeding female students. Each condition included five women except the not psychosis-prone/low ego strength condition which had only four. Women tend to major in the same programs of study as the men.

Inducement for participation was research-participation credit toward students' grades in

introductory psychology and the knowledge that they would receive feedback on how they scored on the CPI.

### *Procedure*

When a *S* arrived at the laboratory, the experimenter first administered the Remote Associates Test, allowing 40 min for its completion. The experimenter then gave the subject a problem in engineering design, the water-for-Tonya problem, allowing 25 min for its completion. The problem was how to provide water for a couple's Siberian husky while they left home on brief trips. It was necessary that the water be released slowly, commensurate with Tonya's need, so that it would not become foul. Instructions suggested that *Ss* use diagrams as they deemed appropriate.

Upon a *S*'s completion of the water-for-Tonya problem, the experimenter told the *S* the three dimensions of the CPI on which he or she had obtained the highest score, reading the *S* the manual definition of each. The experimenter presented all CPI dimensions in a positive light, including the Femininity dimension when scored high by a male. The experimenter then explained simply that the study was an examination of personality profile as it affects creativity and earnestly requested that the *S* not speak to anyone else about the study.

### *Ratings of solutions to the water-for-Tonya problem*

One method for studying creativity has been to have experts rate people's productions for their level of creativity (Amabile, 1982, 1983, 1985; Amabile, Hennessey & Grossman, 1986; Rothenberg, 1986). As a prelude to her experiments on the relation of creativity to intrinsic motivation, Amabile (1983) designed a consensual-validation procedure to measure creativity in *Ss*' productions of collages and Haiku-style poems. Judges who qualified as experts in the domains to be evaluated achieved high levels of interrater reliability. Two general factors resulted from a factor analysis applied to the various dimensions of Amabile's scale; she named these *Creativity* and *Technical Goodness*. As with a previous problem in engineering design (Fodor, 1990), pretesting demonstrated that most of the scales from Amabile's Creativity factor did not demonstrate satisfactory interrater reliability, nor did any of the scales from the Technical Goodness factor. The impression was that most of these scales were better suited to the domains of art and poetry than to engineering design. From among the scales that comprise Amabile's Creativity factor the *Creativity* scale, specifically, proved to be well suited to the present study.

A definition of the Creativity rating scale appeared at the top of the rating form. Judges were three undergraduate students who had completed a psychology course in creativity. The creativity course treated Amabile's consensual validation technique and the meaning of creativity as it applies to various domains of activity, including engineering. Judges were unaware of the personality category of the person whose solution they were evaluating and of the design or purpose of the research. Correlation coefficients for interjudge reliabilities ranged between 0.69 and 0.79.

## RESULTS

Creativity ratings of solutions to the engineering problem were summed for each *S* across the three judges, so that a *S*'s rating could vary from a low of three to a high of 15. Figure 1 displays the resultant means for the four personality categorizations. As predicted, the highest mean Creativity rating ( $M = 10.6$ ) occurred for psychosis-prone *Ss* who scored high in ego strength.

Scores for the Remote Associates Test appear in Fig. 2. Again as predicted, psychosis-prone persons high in ego strength received the highest scores ( $M = 14.7$ ).

Creativity ratings correlated 0.44 with RAT scores. The decision therefore was to perform a multivariate analysis of variance that combined both dependent measures. As recommended by Hummel and Sligo (1971), the multivariate analysis was succeeded by a univariate analysis of each dependent measure in order to trace the source of significant multivariate effects. A one-way MANOVA produced an *F* value (*d.f.* = 1, 92) of 3.35,  $P < 0.05$ . Univariate ANOVAs yielded *F* values of 5.04 for the Creativity-ratings measure,  $P < 0.01$ , and 4.62 for the RAT measure,  $P < 0.01$ .

Tests for pairwise comparisons were via Tukey's Honestly Significant Differences (HSD) test. For Creativity ratings of proposed solutions to the engineering problem, the difference between the mean

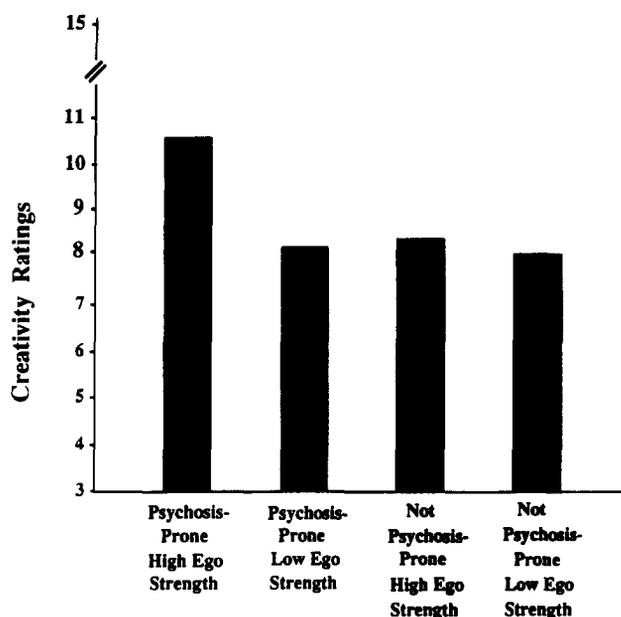


Fig. 1. Mean creativity ratings for proposed solutions to the engineering problem.

for the psychosis-prone/high ego strength category (10.6) and means for each of the remaining categories (8.2, 8.4, and 8.1) was significant at the 0.01 level. The standard deviation for the psychosis-prone/high ego strength category was 2.6. Standard deviations for the remaining categories were 2.8, 2.4, and 2.3, respectively. For RAT scores, the difference between means for the psychosis-prone/high ego strength category ( $M = 14.7$ ,  $SD = 4.5$ ) and the not psychosis-prone/high ego strength category ( $M = 11.3$ ,  $SD = 3.7$ ) was significant at the 0.02 level. Differences between means for the psychosis-prone/high ego strength category and the psychosis-prone/low ego strength ( $M = 10.5$ ,  $SD = 4.4$ ) and the not psychosis-prone/low ego strength ( $M = 10.75$ ,  $SD = 4.6$ ) categories both were significant at the 0.01 level.

To determine to what extent the MMPI classificatory scheme employed in this study included inclinations toward affective disorder, scores on the Hypomania (Ma) and Depression (D) scales were examined for all Ss. Ss designated as psychosis-prone had a mean  $T$  score of 58.8 on the Ma scale, with scores ranging from a low of 41 to a high of 91. Ss who were judged not to be psychosis-prone by MMPI criteria had a mean Ma score of 54.4, with scores ranging from a low of 35 to a high of 78. The difference in Ma scores between psychosis-prone Ss and those not psychosis-prone was not significant ( $F < 1$ ).

Scores on the D scale, by contrast, were widely different between Ss who were designated as psychosis-prone and those who were not. The respective means for the D scale were 54.75 vs 44.6, with ranges of 30–76 and 32–62 for the two categories of Ss. The difference was easily significant at the 0.01 level ( $F = 26.28$ ,  $d.f. = 1,47$ ). The MMPI criterion of psychosis-proneness devised for the present study clearly includes many persons with inclinations toward affective disorder as reflected by high scores on the D scale. Taken by themselves, scores on the D scale did not differentiate between Ss on either measure of creativity within the psychosis-prone/high ego strength category or among Ss overall. Level of ego strength had no influence on Ma or D scores. No other scales from the MMPI differentiated between subjects designated as psychosis-prone and those not so designated.

## DISCUSSION

The findings of this study corroborate and further extend the conclusions reached by Barron (1969) in his research with creative writers and architects. Ego strength appears to combine with psychosis-proneness to favor creative performance both in designing a solution to an engineering

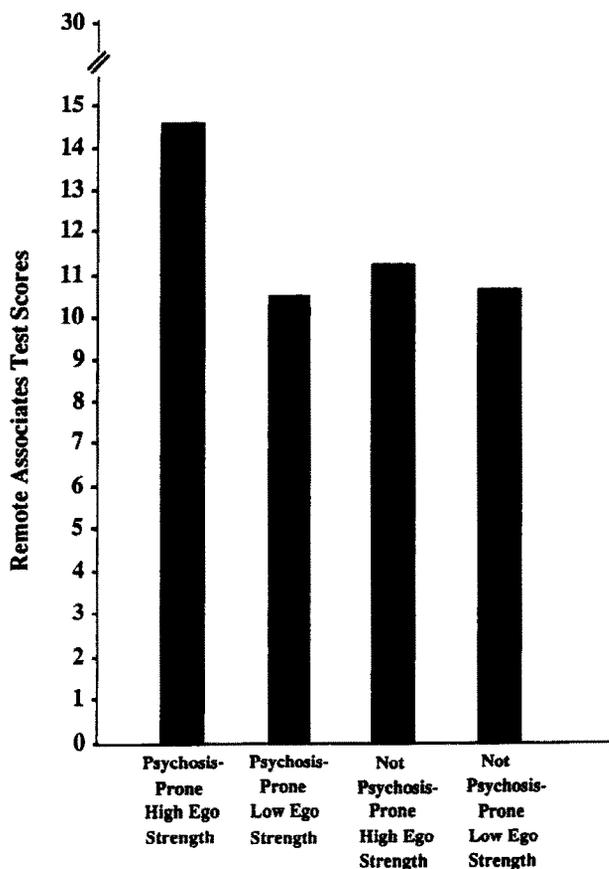


Fig. 2. Mean Remote Associates Test scores.

problem, an activity similar in some respects to architecture, and in scores on the Remote Associates Test. Neither psychosis-proneness in the absence of ego strength nor ego strength in the absence of psychosis-proneness was observed to produce equally high levels of creative performance. In a more recent formulation, Barron (1993) refers to “controllable oddness” as a resource in creativity. An oddness of thought or feeling, in his view, combines with an ability to reconsider and reformulate to produce a “socially communicable original meaning,” Schuldberg (1990) likewise believes that the critical factor that differentiates genius from madness may be ego strength.

It has been said of van Gogh that when he was psychotically disturbed to a severe degree his painting deteriorated, but that if he was visibly psychotic yet could still control and integrate, he did his greatest work (Stein, 1971). The ability to control and integrate, of course, is a principal component of ego strength.

Subsequent to completion of the present study, the thought occurred that psychosis-prone persons as here defined possibly might have some tendency toward visual hallucination or at least visualization as a cognitive strategy. Guilford(1966) specifically includes visualization as an aspect of his structure-of-intellect model. It occurs within the category of ‘transformation’ under the dimension of ‘products’:

Among the other factors it now seems that the layer in the intellect having to do with transformation should be given special consideration (as relates to creative ability). This category includes such factors as visualization....(p. 110)

Examination of students’ solutions to the water-for-Tonya problem quickly revealed that there were marked differences in the degree to which diagrams figured into the design, as though some students

Table 1. Numbers of Ss showing complex visualization

	High ego strength	Low ego strength
Psychosis-prone	18 ( <i>n</i> = 24)	12 ( <i>n</i> = 24)
Not psychosis-prone	13 ( <i>n</i> = 24)	9 ( <i>n</i> = 24)

relied more on visualization in their quest for a solution than did others. I devised a rating scheme of three categories:

*Visually complex design (VC)*. Depicts mechanical mechanism of interrelated parts; carries the major meaning of the design, requiring little verbal explanation to round it out.

*Low complexity design (LC)*. Is merely ancillary to the major meaning of the design which is mostly verbal.

*No diagram (ND)*. No diagram appears.

Using this rating scheme, two persons independently examined 20 water-for-Tonya solutions collected in a different study and achieved a category agreement of 90%. One of these persons then rated blind all 96 of the water-for-Tonya solutions from the present study. The resulting data appear in Table 1. The LC and ND categories were combined for purposes of analysis. Persons who were both psychosis-prone and high in ego strength were the ones most likely to employ complex visualization in proposing a solution. Computation of a Pearson  $\chi^2$  statistic yielded a figure of 7.72, d.f. = 1,  $P < 0.01$ . That these persons may have visualized to the point of hallucinating obviously is too broad a leap of inference, but it is clear that they relied on a visual mode of cognitive activity. Ego strength must assume an organizing role in the process. Otherwise, it is difficult to understand why the other category of psychosis-prone persons, those low in ego strength, did not also evince high levels of complex visualization (there was no special tendency for them to display a less elaborate mode of visualization either).

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