

Creativity in Manic-Depressives, Cyclothymes, Their Normal Relatives, and Control Subjects

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Studies of creativity and affective illness typically focus on eminent individuals in specific fields. This is the first study to select subjects solely by diagnosis, and then evaluate their overall creative accomplishments. Seventeen manic-depressives, 16 cyclothymes, and 11 normal first-degree relatives we compared with 33 controls with no personal or family history of major affective disorder, cyclothymia, or schizophrenia; 15 controls were normal and 18 carried another diagnosis. Peak creativity was assessed by raters blind to subjects' diagnosis with the use of the Lifetime Creativity Scales. Orthogonal contrasts showed (a) creativity to be significantly higher among the combined index subjects (manic-depressive, cyclothymes, and normal relatives) than among controls ($p < .05$), (b) no significant difference between normal and ill controls, and (c) suggestively higher creativity among normal index relatives than among manic-depressives ($p < .10$). (Cyclothymes fell close to normal relatives.) Liability for manic-depressive illness may carry advantages for creativity, perhaps particularly among those individuals who are relatively better functioning.

Bipolar manic-depressive illness (MDI) tends to run in families. Adoption and twin studies support a marked genetic conation to this familial pattern (e.g., Bertelsen, 1979; Mendlewicz & Ranier, 1977; Wender et al., 1986). In this study we investigated whether manic-depressive pathology might be associated with positive behavioral characteristics that run in the same families. Such a *compensatory advantage* to genes that increase vulnerability to illness has been proposed for behavioral disorders such as schizophrenia (e.g., Kinney & Matthyse, 1978). A rough analogy may be drawn to sickle cell anemia, although the genetics of affective disorder are likely more complex. In the sickle-cell case, individuals homozygous for the mutant gene typically have severe anemia with clinical complications and often suffer an early death. In contrast, the much larger number of heterozygous carriers of the gene are frequently asymptomatic and have the advantage of increased resistance to malaria.

The present study asks whether there is a familial compensatory advantage to bipolar illness involving creativity. By analogy with the sickle cell example, creativity was hypothesized to be less prominent in manic-depressives themselves than in their better functioning relatives. The present research is, to our knowledge, the first to advance this hypothesis. It is also the first study to group subjects solely by psychiatric diagnosis and then to consider their overall creative accomplishments. Using the Lifetime Creativity scales (LCS; Richards, Kinney, Benet, & Merzel, 1986), we compared manic-depressives, cyclothymes, and their first-degree normal relatives with psychiatrically normal and ill controls.

Previous studies have reported both familial and individual associations between creativity and major affective disorders (for reviews, see Andreasen, 1978; Richards, 1981). However, it is difficult to generalize from these previous studies to the typical family with bipolar members. First, these studies typically did not consider creative accomplishments unless they were socially recognized, and these studies were often constrained to certain traditionally creative areas involving the arts or sciences. Second, subjects were initially selected for high creativity, and their individual or family psychopathology was then assessed rather than the other way around.

Keeping in mind these limitations, in existing studies of families, one finds a higher prevalence of endogenous psychosis (MDI, schizophrenia, and undetermined psychosis) in the relatives of artists and scientists than in the general population (Juda, 1949), and one finds a higher prevalence of major affective disorder in the relatives of creative writers than in the relatives of controls (Andreasen & Canter, 1974).

One researcher did begin with index cases identified by psy-

A version of this article was presented at the 93rd annual meeting of the American Psychological Association, Los Angeles, August 1985.

We are grateful to Paul Wender, Seymour Kety, Fini Schulsinger, and David Rosenthal for permission to use the present sample and interview data base for this study of creativity, and to the Spencer Foundation for its support of the further development and refinement of the Lifetime Creativity Scales. We wish to thank Seymour Kety, Steven Matthyse, Sandow Ruby, and Christine Wateraux for their helpful suggestions. Sincere thanks are also extended to Beth Gerstels and Carol Paik for their assistance in making creativity assessments, and to Heidi Daniels and Karen Linkins for work on data analysis and preparation of tables.

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chopathology rather than creativity (Karlsson, 1970) and found greater social recognition for artistic or scientific work in the families of psychotic probands than in the families of controls. However, diagnoses were not determined for these socially recognized relatives. No conclusions could therefore be drawn about creativity and psychiatric status in the same individuals. Relatives of manic-depressives seem to have contributed more to this pattern of familial recognition than the relatives of schizophrenics (Andreasen, 1978; Richards, 1981). In an associated examination of extensive family trees (Karlsson, 1968, 1970), the same family branches were found to be high in both psychosis and social recognition.

Only one adoption study has focused on the familial relation between creativity and psychopathology. McNeil (1971) found an association between the adoptees' level of socially recognized creativity and the prevalence of psychopathology in their biological—but not adoptive—parents. Thus, genetic factors are implicated. Affective disorder appeared to be particularly important to this creativity-psychopathology relation (Richards, 1981).

We now turn to studies of creativity and psychopathology in the same individual. Among McNeil's (1971) adoptees, there was a significant relation between creativity and the overall prevalence of psychopathology. McNeil found personality disorders among adoptees, but no major mood disorders or psychosis. Other investigators, however, found elevated levels of psychosis (Juda, 1949) and major affective disorder (Andreasen & Canter, 1974; Jamison, in press) compared with control or general population levels, findings that are also supported by data from some uncontrolled studies (see Andreasen, 1978; Richards, 1981). However, in all but one study (Andreasen & Canter, 1974), the typical creator either carried a milder diagnosis or was considered psychiatrically normal.

In fact, there is good reason to expect that a number of milder psychiatric disorders may have been missed in most previous research; only Andreasen and Canter's (1974) study used direct personal interviews to determine diagnosis. In addition, no previous study has considered family psychiatric history along with the creator's own psychiatric condition; family history might have been of particular interest for the less-disordered creator.

It has been argued that affective disorder may carry particular advantages for creativity but that these benefits may be greater in affective disorder's milder rather than more severe forms. Several potential advantages of a mild hypomanic state are given (Richards, 1981). In the third edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III)* (American Psychiatric Association, 1980), two of the criteria for the hypomanic phase of cyclothymic personality disorder involve sharpened and unusually creative thinking and increased productivity. Cyclothymic personality was a frequent second diagnosis in Andreasen and Canter's (1974) study of eminent creators, and hypomanic symptomatology was also found frequently in Jamison's (in press) sample. There is evidence that cyclothymia may represent a milder manifestation of bipolar liability; cyclothymic personality is more prevalent, for instance, in relatives of manic-depressives than in relatives of unipolar depressives and controls (Weissman et al., 1984). Richards (1981) proposed that in some psychiatrically normal cre-

ators, creativity may be facilitated by subclinical factors related to a family history of major psychiatric disorder.

In the present study we examine whether creativity is an inverted-U function of the degree of manifest bipolar psychopathology in individuals at risk for manic-depressive illness (a) Individuals with frank manic-depressive illness were expected to manifest an intermediate mean level of creativity, (b) cyclothymes to have the highest mean creativity, and (c) the psychiatrically normal first-degree relatives of manic-depressives or cyclothymes to show intermediate creativity. (Although normal relatives who carried genetic liability for bipolar disorder were expected to be particularly creative, our sample of normal relatives was assumed to be heterogeneous for such liability; it is unlikely that all of these relatives would have inherited genes conferring such liability.) In addition, these three index groups taken together were expected to show higher creativity than a group of control subjects who lacked any personal or family history of major affective disorder.

We also hypothesized that the inverted-U pattern would persist after the effects of age, education, and intelligence were partialled out of the creativity scores. Variables related to education and intelligence were expected to show positive associations with creativity (Barron, 1969; Barron & Harrington, 1981; Richards & Casey, 1979); such factors may enhance the realization of creative potential and should not be regarded merely as nuisance variables. However, the projected differences in creativity between groups, if meaningful, should not be fully explained by such factors (e.g., Getzels & Jackson, 1962). Previous studies of associations between creativity and psychopathology have not taken these variables into account.

Thus the present study is distinguished in several respects from most previous research on creativity-psychopathology relations. In addition to providing the first general study of creativity in subject groups defined solely by psychiatric diagnostic criteria, the present research considers together the individual and the family psychiatric history of subjects, and it uses data from personal interviews as the basis for assessing both psychiatric status and creativity of the primary study subjects. Use of a new and broad-based measure with high interrater reliability and multiple indications of construct validity—the LCS—allowed for assessment of adult creativity accomplishment among these diverse subjects. Finally, appropriate controls were instituted for variables such as education and intelligence.

Method

Sample and Diagnostic Data

The 77 subjects in this study all met our diagnostic criteria among those previously interviewed as part of a Danish adoption study of affective disorder conducted by Wender et al. (1986). Wender et al.'s subjects were the biological and adoptive relatives of 72 index adoptees (diagnosed as having manic-depressive illness, unipolar depression, neurotic depression, or affect reaction, the latter a Danish diagnosis) and 72 control adoptees, matched on age, sex, age at adoption, and socioeconomic status of the adoptive family. Relatives of the adoptees were identified via thorough searches of centralized Danish registers. Greater detail on this adoption study is found elsewhere (Wender et al., 1986). A total of 174 subjects, or 23% of the sample of biological and adoptive relatives previously identified by Wender et al., had been personally in-

interviewed, providing a basis for assessing creativity, psychiatric diagnosis, and other variables in the present study. We based diagnoses for the remaining relatives in the sample on formal hospital and clinic records as described by Wender et al. (1986). To meet the requirements of the present study, it was necessary to modify the design of Wender et al.'s original adoption study. Each subject's family psychiatric history was as complete as possible, based not only on the adoptee to whom the subject was biologically related but also on all of the subject's other identified biological relatives in the entire sample.

For the interviewed subsample, blind consensus diagnoses were made by Wender et al. (1986), after interview material had been edited to remove potentially biasing information. Also, a primary and a secondary diagnosis were recorded for each subject using criteria of *DSM-II* (American Psychiatric Association, 1968). (Some *DSM-III* diagnoses were also available [Wender, 1986], but they were based only on hospital records, not interview data, they lacked the added sensitivity of primary and secondary diagnoses, and they were less, rather than more, conservative for our major diagnostic categories—most notably the *DSM-II* vs. *DSM-III* diagnosis for unipolar depression.)

For the present study, we included subjects in the manic-depressive group if they received primary or secondary diagnoses of definite or possible manic-depressive illness. This raised the likelihood of being able to distinguish a spectrum, or range, of disorders, including some of the less severe cases. The secondary diagnosis for each of these subjects usually involved another form of affective disorder. Subjects were considered cyclothymic if they received this as a primary or secondary diagnosis; nearly all of these cases had no other recorded psychopathology. Some individuals who might receive research diagnoses of bipolar II disorder (included under atypical bipolar disorder in *DSM-III*) might have been included in this group. Our sample of normal relatives was composed of interviewed subjects who received no primary or secondary psychiatric diagnosis whatsoever and who were first-degree biological relatives of either manic-depressives or cyclothymes as defined previously.

Our control subjects were composed of all those biological and adoptive relatives of the psychiatrically normal control adoptees, previously identified by Wender et al. (1986), who also satisfied our additional screening criteria. These criteria included having neither a personal nor a family history of (a) major affective disorder or cyclothymia, (b) possible variants of bipolar disorder (acute schizophrenia, schizoaffective disorder), or (c) schizophrenia or suicide. These procedures yielded a sample of 17 manic-depressives, 16 cyclothymes, 11 psychiatrically normal first-degree relatives, 15 control subjects diagnosed as normal, and 18 controls carrying a diagnosis other than those just noted. These groups are characterized demographically in Table 1.

Data Base, Data Preparation, and Measures

Subjects were interviewed by Inge Lunde, a Danish psychiatrist who is fluent in English as well as Danish. Lunde was blind to relatives' relationships to probands. The typical interview lasted several hours and included the taking of a general history for diagnostic and other purposes. Subjects were asked in an open-ended way about their major formal and informal occupational and avocational activities during childhood, adolescence, and, particularly, adulthood. Results of the interviews were reported in English, in detailed narrative form. Information on lifetime vocational and avocational history was used to assess creativity, as required by our creativity measure. Vocational history was reported for every subject, typically as a chronological description of activities; avocational information was available for 81% of the immediate study sample of 77 subjects. (Avocational information was unavailable for 5 manic-depressives, 2 cyclothymes, 2 normal relatives, 3 psychiatrically normal controls, and 3 controls carrying a diagnosis.)

Prior to the rating of creativity variables, all potentially biasing infor-

mation was edited out of the interview report by a member of the research team other than the rater. This editor eliminated any references to positive or negative aspects of personality, intellectual functioning, family psychiatric history, or the subject's own psychiatric diagnosis. Age, sex, and educational level were recorded directly at this point. Diagnostic data were recorded independently, along with a global intelligence estimate that was made on a 3-point scale (1 = *above-average*, 2 = *average*, and 3 = *below-average intelligence*) based on a standard psychiatric determination. (Because subjective ratings of intelligence may be inflated by observed creativity [Barron & Harrington, 1981], it is possible that creativity variance could be erroneously removed when intelligence is partialled out of creativity scores. However, this should not affect the relative—rank-order—standing of the psychodiagnostic groups in this study.)

Lifetime Creativity Scales

Characteristics of the LCS are summarized here and described in greater detail elsewhere (Richards et al., 1988). The LCS conceptualization of creativity departs from more restrictive views of creative accomplishment, for example, that such accomplishment has occurred only rarely throughout history (as in the work of a Beethoven or Einstein) or that it occurs more broadly but only in traditionally creative fields such as the arts and sciences. In contrast, in the present study creativity is viewed as a quality or capability that varies broadly in the general population and may be manifested in a wide variety of outcomes involving virtually any field of endeavor (see Richards et al., 1988). This perspective at once bears similarities to the views on creativity expressed by humanistic psychologists, such as Maslow (1968) or Rogers (1961), and to the concept of phenotypic plasticity underlying human inventiveness and adaptability that has been described by evolutionary biologists (e.g., Dobzhansky, 1962).

The empirical rationale for broad-based assessment of creativity is based on evidence for a disposition toward originality and core characteristics of the individual associates with creativity across diverse fields of endeavor (Barron, 1955, 1969; Barron & Harrington, 1981). Assessment of creativity by the LCS is based on subjects' real-life vocational and avocational activity. This approach had been taken in several previous studies of creativity and psychopathology (Andreasen & Canter, 1974; Heston, 1966; McNeil, 1971). However, we extended this approach to nonpsychiatric populations, considered all creative activities over the adult years rather than present activities only, and removed any requirement that endeavors be socially recognized.

Seven scales make up the LCS. These pertain to the quality or quantity of creative accomplishment over the adult lifetime. Peak creativity and extent of creative involvement are each assessed separately for vocational and for avocational activity. We distinguished between creativity at work and leisure in order to examine expected group differences in emphasis between these two areas. Of relevance here are suggestions (e.g., Akiskal, Hirschfeld, & Yerevanian, 1983) that subjects at risk for bipolar disorder may concentrate their energies disproportionately on work. The LCS also contain summary measures for peak creativity and extent of creative involvement as well as a measure of overall creativity.

Peak measures are designed to identify the strongest real-life reflections of an underlying disposition toward originality (Barron, 1955, 1969), capturing those occasions during the adult years when personal and environmental conditions for creativity are optimal. The extent-of-involvement scales identify the relative importance of creative versus other activity during the lifetime and are seen as more responsive to environmental conditions that help or hinder creativity.

The overall-peak-creativity measure was viewed a priori as providing the best test of any fundamental intergroup differences in creative capability, while minimizing the effects of the environment. It reflects the maximum level of creativity at either work or leisure. As such, it does

Table 1
Creativity and Demographic Variables on Five Diagnostic Groups

Group	N	Peak creativity ^a		Adjusted peak creativity ^b		Age		Educational level		Intelligence estimate	
		M	SD	M	SD	M	SD	M	SD	M	SD
Manic-depressives											
Males	5	2.60	0.89	2.30	.72	42.0	16.4	12.20	5.76	1.40	.55
Females	12	2.08	0.90	2.08	.74	47.3	16.1	9.83	2.79	0.92	.29
Both sexes ^c	17	2.30	0.87	2.20	.72						
Cyclothymes											
Males	8	3.13	0.83	2.78	.62	51.6	15.4	9.38	3.70	1.63	.52
Females	8	2.50	0.53	2.37	.56	52.0	19.0	9.38	3.02	1.13	.35
Both sexes	16	2.79	0.69	2.55	.57						
Normal relatives											
Males	7	3.29	0.49	3.00	.36	46.3	17.0	11.71	4.31	1.44	.53
Females	4	2.25	0.96	2.22	.88	38.5	7.2	10.25	1.89	1.00	.00
Both sexes	11	2.83	0.72	2.63	.59						
Normal controls											
Males	5	2.80	1.30	2.73	.75	48.8	21.1	10.60	2.51	1.20	.84
Females	10	2.10	0.74	1.97	.79	54.3	25.6	8.80	2.90	1.20	.42
Both sexes	15	2.38	0.92	2.27	.77						
Controls with a diagnosis											
Males	10	2.30	.67	2.29	1.07	53.7	20.7	9.02	3.40	1.20	.63
Females	8	2.25	.89	2.22	.73	56.9	18.0	8.00	1.07	1.13	.35
Both sexes	18	2.23	.78	2.21	.93						

^a Raw scores.

^b Scores were adjusted for the effects of age, education, and intelligence.

^c The effects of sex have been partialled out.

not represent a simple combination of peak vocational and avocational indexes. Patterns between subjects will differ. (For example, a "workaholic" with a relatively low peak creativity at leisure could have high overall creativity, reflecting the dominance of a high level of peak vocational creativity in his or her life.) Overall peak creativity was therefore the focus of this study; vocational and avocational peak creativity served as supplementary measures.

Following Barron (1969), we used two general criteria to identify creative outcomes: (a) that an unusual or novel element be involved (originality criterion) and (b) that outcomes be meaningful to others (criterion of adaptation to reality) rather than bizarre and idiosyncratic. Peak-creativity assessments were each made on 6-point scales (1 = insignificant, 2 = minor, 3 = some, 4 = moderate, 5 = high, and 6 = exceptional creativity), where the level of *some creativity* was taken as a normative average. Only major enterprises or ongoing areas of activity were considered (e.g., building a house or designing an advertising campaign), so creative efforts are more likely to reflect true capability rather than chance fluctuations. The significance of innovative elements to a total enterprise is based on the departure of this enterprise from more typical products and practices. When elaborative detail is lacking (typically the case for vocational activity in this sample), alternative ratings may be assigned on the basis of detailed standard descriptions of the activity (Kolstrup, 1982; U.S. Department of Labor, 1977). Two consultants on Danish culture helped formulate methods that were valid for a Danish population. A rating guide provides specific criteria for each rating level (see Table 2), along with multiple examples. (The guide is available for research purposes to the interested investigators.) Tables 3 and 4 provide some abbreviated sample descriptions of subjects at three levels of peak vocational and avocational creativity.

Validation data for the LCS were based on three large independent samples, as described further in Richards et al. (1988). The first two validation samples were large, representative control samples ($N_s = 173$ and 209) from Danish psychiatric adoption studies. Subjects were

drawn from all over Denmark and represented a wide range of other demographic factors. The third validation sample was the full inter-viewed adoption study sample ($N = 174$), from which the present study subjects were drawn. In each case, data distributions were approximately normal for all scales, consistent with the broad definition of creativity and our norm-referenced assessment method. Interrater reliability ranged from good to excellent. It was calculated for 10 randomly selected subjects from each sample. There were four, seven, and three raters, respectively, for the affective, Copenhagen, and Danish provincial samples; interrater reliability was calculated between all pairs of raters in each case. For the affective sample, the mean reliability for vocational creativity measures was .76 ($SD = .21$); for avocational measures, .83 ($SD = .40$); and for overall measures, .89 ($SD = .33$). Corresponding figures for the Copenhagen sample were, for vocational creativity measures, .9 ($SD = .10$); for avocational measures, .86 ($SD = .05$); and for overall measures, .81 ($SD = .14$). For the Danish provincial sample, the reliabilities were, for vocational measures, .87 ($SD = .08$); for avocational measures, .91 ($SD = .04$); and for overall measures, .88 ($SD = .07$).

Several lines of validity evidence are available. They involve (a) sampling or content validity, (b) hypothesis testing with correlates of adult creativity suggested by the research literature (childhood creativity, fantasy, appreciation of creativity, and Holland's, 1973, primary interest styles), and (c) factor analyses of LCS and other variables showing the structure of the creativity domain and discriminant validity from selected control variables (Richards et al., 1988).

Factor analyses for all three samples involved a principal-components solution with varimax rotation, with each analysis yielding similar results on key points. Regarding creativity factors, the first analysis was viewed as exploratory and the second and third as confirmatory. Each showed (a) the distinctness of the vocational and avocational creativity measures, each of which defined an orthogonal factor; (b) a strong relation between peak creativity and the involvement scales within the vo-

Table 2
Definitions of Levels of Two Types of Creativity Scales

Level	Definition
Levels for peak creativity	
Not significant (0)	Routine or prescribed endeavors with negligible innovative aspects
Minor degree (1)	Small unexceptional departures from routine or prescribed endeavor
Some (2)	Greater innovativeness, but not unusual in the population
Moderate (3)	Presence of central innovative elements that stand out in the population, although not markedly; these may involve major modifications of common practices or products
High (4)	Presence of markedly distinctive innovative elements that set endeavors well apart from others in the population
Exceptional (5)	Radical departures from the commonplace; these may require conceptual reorganization to be assimilated
Levels for extent of creative involvement	
Not Significant (0)	Highly prescribed or routine patterns of lifetime activity
Minor Degree (1)	Prescribed or routine patterns, broken by brief, rare instances of innovative activity
Some (2)	Greater extent of innovative activity than above, but not unusual in the population, and other activity tends to predominate
Moderate (3)	Notable innovative activity in a pattern that tends to admix this with other forms of endeavor
High (4)	Markedly distinctive emphasis on innovation—a dominant life theme and primary commitment
Exceptional (5)	Intense, pervasive, and perhaps compulsive preoccupation with innovative activity over time to the virtual exclusion of other emphases

ational, avocational, and summary measures; and (c) the distinctness of creativity from control variables including socioeconomic status, educational level, and intelligence, which tend to define other factors. (These variables still showed the predicted positive, but moderately low, correlations with creativity variables. For more detailed information on validity, including associations of LCS scores with predictors of creativity reported by other investigators, see Richards et al., 1988).

In summary, the results support the choice of overall peak creativity as the summary variable and vocational and avocational peak creativity as two different dimensions of this peak creative accomplishment. Peak measures were superior to extent measures for our purposes because they explain much of the extent variance while minimizing the effect of environment in the estimate of underlying creative capability.

Results

Preliminary Analyses

Residual peak creativity scores were derived by partialing out the effects of age, education, and intelligence from the measure of overall peak creativity. This was done for male and female subjects separately by using all subjects of each sex in the inter-

viewed sample of 174 subjects. Adjusted raw and residual scores were derived for male and female subjects by adding back the grand mean of creativity for each sex. A preliminary 2 x 5 analysis of overall peak creativity, with diagnostic group and sex as independent variables, showed no significant Sex x Diagnosis interaction, $F(4, 67) = 0.68, p < .60$, making it possible both to partial out a significant main effect of sex, $F(1, 67) = 8.90, p < .005$, which favored male subjects, and to combine male and female subjects for subsequent analyses of both raw and adjusted creativity scores. Descriptive statistics on overall peak creativity and on the covariates are shown by group in Table 1. There was no significant diagnostic Group x Sex interaction for either vocational or avocational creativity. Interestingly, there was another significant main effect of sex for vocational creativity, $F(1, 63) = 5.76, p < .02$, but not for avocational creativity.

Table 3
Abbreviated Examples of Subjects at Three Rating Levels of Peak Vocational Creativity

Example 1	Example 2
No significant creativity	
Mixed and carried mortar for local brick layer for 20 years, then inherited a large income-paying trust fund and retired to a passive life on a country estate.	Washed store windows for 3 years under foreman's supervision, spent 5 years on assembly lines in two factories, and, for the past 11 years, has done routine quality-control tasks in a brewery.
Moderate peak creativity	
Longtime owner and manager of a small dairy farm who, after 10 years of producing cheese and other dairy products, expanded and began marketing through a local distributor.	Optician who spent 4 years selling optical items, then acquired a small optical shop, and now grinds lenses to prescription while managing the retailing of standard optical products.
High peak creativity	
Former avant garde dancer and choreographer who developed and directed a variety of unusual productions for several dance companies, but, postwar, has worked solely as a hotel clerk.	Entrepreneur who advanced from chemist's apprentice to independent researcher of new products before starting a major paint manufacturing company, and whose operation surreptitiously manufactured and smuggled explosives for the Danish Resistance during World War II.

Note. The primary distinction between avocational and vocational activities is whether the activity was financially compensated. The following points are pertinent to both avocational and vocational measures: (a) peak creativity is based only on the level of the most creative major enterprise, (b) appreciation of others' creativity is not credited on these scales, and (c) social recognition is not required as a criterion for higher creativity. Examples have been altered to protect subjects' confidentiality.

Table 4
Abbreviated Examples of Subjects Falling at Three Rating Levels of Peak Avocational Creativity

Example 1	Example 2
No significant creativity	
Once read movie magazines intensively, but now spends most evenings with the new family television. Also does much needlepoint following specified patterns and, on weekends, watches spouse play handball.	Often reads in spare time, has a standing subscription to the local theatre, belongs to a health club, has been going daily for directed group calisthenics, attends a social club to watch weekly television sporting events with friends, and occasionally attends local soccer games.
Moderate peak creativity	
Active church member who has ushered at church services for over 20 years, has sung for the last 10 years in the alto section of the church choir, and who recently has been volunteering on a committee designed to expand parish membership.	Avid reader and sports fan/spectator who previously completed a night-school journalism course and now gives brief accounts of sporting events for a monthly community newspaper. On weekends, also volunteers as an assistant coach for a children's swim team.
High Peak Creativity	
Amateur archaeologist who for years has spent summers and other free time seeking new sites, initiating archeological digs with professionals from a nearby university, researching artifacts, reconstructing aspects of primitive societies, and collaborating in articles on this work.	Invests much spare time in working with own handicapped child and once, over several years, designed and constructed a complex apparatus to help this child with locomotion, gross changes of posture, and fine motor manipulation of objects. Now works as a volunteer teacher twice a week to help other handicapped children use this invention.

Major Results: Overall Peak Creativity

Four statistically independent orthogonal contrasts, derived from our hypotheses, tested whether creativity was (a) higher in all index subjects (manic-depressives, cyclothymes, and normal first-degree relatives combined) than in control subjects lacking risk for affective disorder; (b) higher in cyclothymes than in other index subjects (i.e., than in manic-depressives and normal relatives combined), consistent with our inverted-U configuration; (c) different in normal relatives versus manic-depressives (with no significant difference expected for this contrast, in accord with the inverted-U hypothesis); and (d) different in the psychiatrically normal controls versus those controls who had a diagnosis (again, no difference was expected). We used one-tailed tests for the first two contrasts because the direction of the effect had been hypothesized, and we used two-tailed tests

for the last two hypotheses. Results are portrayed graphically in Figure 1.

The first contrast was significant ($t = 1.78, p < .05$), and the third was suggestive ($t = 1.70, p < .10$), whereas the second and fourth contrasts were nonsignificant. Thus, between control groups (i.e., the psychiatrically normal controls and those carrying a diagnosis), there was no significant difference. However, the combined index subjects (manic-depressives, cyclothymes, and normal relatives) were significantly higher on overall peak creativity than all control subjects combined. Interestingly, first-degree normal relatives of manic-depressives and cyclothymes were suggestively higher on creativity than the manic-depressive subjects, whereas cyclothymes did not show the significantly higher creativity that was expected when compared with manic-depressives and normal relatives combined. Inspection of Figure 1 suggests the interesting reason behind this: Normal relatives and cyclothymes were both comparably high on creativity compared with other groups.

When the effects of age, education, and intelligence were partialled out, index subjects remained suggestively higher on creativity than did controls ($t = 1.31, p < .10$). The ranking of group means remained very similar to that in the original analysis (Spearman rank-order correlation of .90, $p < .02$); notably, normal relatives and cyclothymes still showed the highest creativity (see Figure 1).

When the specific areas of creative activity of all index subjects with moderate or higher creativity scores were examined, we found that vocational activity was divided more or less equally among the arts, sciences, humanities and social sciences, and organizational and leadership roles. In contrast, avocational activity was almost entirely confined to crafts and the fine arts—perhaps because such hobbies have traditionally been emphasized in Denmark. Activities involving visual con-

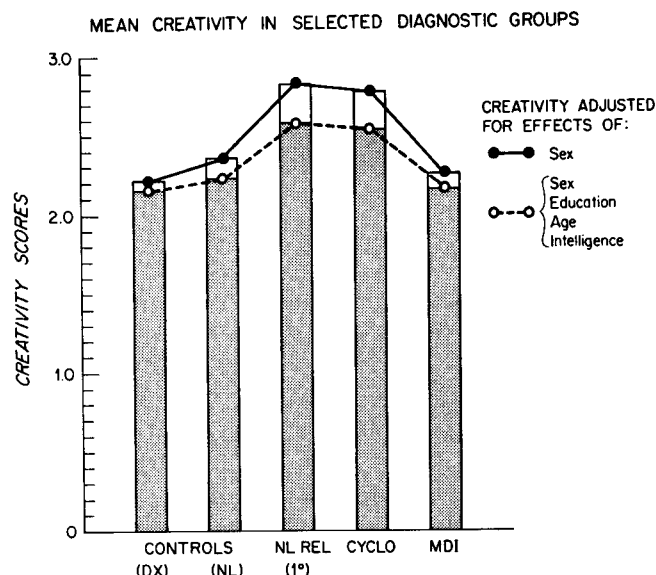


Figure 1. Mean Overall Peak Creativity scores for (a) controls with a diagnosis (DX), normal controls (NL), (c) normal first-degree biological relatives of cyclothymes and manic-depressives (NL REL), (d) cyclothymes (CYCLO), and (e) manic-depressives (MDI).

tent were nearly as prevalent as those involving language, music, and movement combined. A similar pattern appeared in creative controls.

Supplementary Analyses: Vocational and Avocational Peak Creativity

Adjusted scores were again used in these analyses. Using the same orthogonal contrasts, normal relatives scored significantly higher than manic-depressives on avocational peak creativity ($t = 2.57, p < .05$), with cyclothymes falling in between. Thus, avocational peak creativity tended to vary directly with degree of psychological health. However, on vocational peak creativity, cyclothymes were significantly higher than the other two index groups combined ($t = 1.69, p < .05$, one-tailed).

Discussion

A modification of the original inverted-U hypothesis can be proposed. Overall peak creativity may be enhanced, on the average, in subjects showing milder and, perhaps, subclinical expressions of potential bipolar liability (i.e., the cyclothymes and normal first-degree relatives) compared either with individuals who carry no bipolar liability (control subjects) or individuals with more severe manifestations of bipolar liability (manic-depressives). Indeed, some normal relatives might have been *hyperthymic* (Akiskal, 1983). Supplementary results suggest that cyclothymes and normal relatives may tend to realize their creative potential in different ways. In avocational activities (perhaps because they tend to involve fewer external structures, rewards, or constraints than occupational activities), creativity in subjects at risk for bipolar disorders may vary directly with the level of personal functioning; here, normal relatives showed the highest creativity. In vocational activity, the high creativity of cyclothymes, and the notable differential between vocational and avocational creativity for manic-depressives compared with other groups, complement previous research reporting that a driven, work-oriented temperament may be associated with risk for manic-depressive illness (Akiskal et al., 1983).

Among normals, it is a subject's relationship to a manic-depressive or cyclothyme, not psychiatric normalcy per se, that predicts heightened creativity. There may be a positive compensatory advantage (Kinney & Matthyse, 1978) to genes associated with greater liability for bipolar disorder. The possibility that normal relatives of manic-depressives and cyclothymes have heightened creativity may have been overlooked because of a medical-model orientation that focused on dysfunction rather than positive characteristics of individuals. Such a compensatory advantage among the relatives of a disorder affecting at least 1% of the population could affect a relatively large group of people.

The finding of enhanced creativity in cyclothymes is consistent with results on creative persons (Andreasen & Canter, 1974; Jamison, in press) and extends this association to the general population. Previous work can be interpreted to suggest a higher prevalence of bipolar disorder Type II (Andreasen & Canter, 1974; Jamison, in press) as well as Type I (Juda, 1949) among eminent creators. The present findings on manic-depressives do not contradict this, for the present study was the

first to investigate relations between creative accomplishment and psychopathology in subjects initially identified by psychodiagnostic criteria rather than by creativity—a very different research design (Richards, 1981). Moreover, different forms of bipolar disorder (e.g., those varying in frequency and severity of manic and depressive phases) may carry different consequences for creativity.

It is noteworthy that eminent artists and writers have described hypomanic symptomatology during intense creative periods (Jamison, in press) and that manics and hypomanics have attributed both immediate and lasting effects on creativity to hypomanic episodes (Jamison, Gesner, Hammen, & Padesky, 1980; Kinney, Richards, Daniels, & Linkins, 1988). It will be important to distinguish between potential state versus trait characteristics that may enhance creativity. It would be fortuitous if one such trait led to discovery of a biological marker that could track inherited bipolar liability through a pedigree in clinically unaffected as well as affected relatives. In addition, there would be major clinical implications if genotype-environment interactions could be identified that lead to enhanced creativity. Positive intervention might then not only prevent the development of bipolar disorders but also foster creative talent and productive contribution to society.

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Received February 26, 1987

Revision received August 1, 1987

Accepted October 16, 1987 ■