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It is proposed that both curiosity and intelligence are necessary but not sufficient conditions for creative production. Research literature is discussed concerning curiosity as a motivational construct (a state of arousal), and as a personality trait, supporting the notion that curiosity is necessary to creativity. Research relating intelligence and creativity is then discussed, coming to the general consensus that creative individuals must have at least minimal ability to deal inventively with symbol systems and to conceptualize the environment. The authors find that both traits correlate significantly with high scores in a test of creativity. Some 75 nursing students were asked to complete intelligence and curiosity tests as well as the Remote Association Test and a test which required production of humorous captions for a number of Thematic Apperception Test cards. Results generally supported the hypothesis. (BP)

# Two Necessary Conditions for Creativity

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## Abstract

From a review of the literature on curiosity and creativity, the senior author (Day, 1968a) has argued that both curiosity and intelligence are necessary but not sufficient conditions for creative production.

Curiosity has been studies both as a motivational construct and as a personality trait. In the former instance curiosity has been defined as a state of arousal induced by collative variability in stimulation (novelty, complexity, ambiguity, etc.). A number of studies have shown that individuals generally prefer to attend to, and explore stimulation of an intermediate level of collative variability and that preference for this level can be altered by manipulating environmental and organismic factors. Research into curiosity as a personality trait has found that individual differences exist in the level of collative variability which people will prefer or towards which they will express an interest. The notion that curiosity as a personality trait is a necessary condition for creative production was advanced (Day, 1968a).

Abstract (p. 2)

Research has also been invested in the study of the relationship between intelligence and creativity. Many of the findings of this research served to point out the devisiveness in definitions of both concepts. A number of psychologists have argued that some creativity measures frequently correlate more with intelligence scores than with each other, while others have consistently failed to find significant correlations between measures of both. However, the general consensus is that creative individuals must have at least a minimal ability to deal inventively with symbol systems and to conceptualize the environment (Getzel and Jackson, 1962). Thus there is general feeling that intelligence too is a necessary condition for creative production.

Recent evidence by these authors has encouraged the idea that both of these traits may independently contribute to creativity, for both measures were found to correlate significantly with high scores in a test of creativity. Seventy-five nursing students were asked to complete intelligence and curiosity tests as well as the Remote Association Tost and a test which required the production of humorous captions for a number of TAT cards. Results generally supported the hypothesis.

# Two Necessary Conditions for Creativity

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Research into creativity has generally been concentrated on a description of "the creative individual" and on the identification of the sufficient, or at least necessary conditions for creative production. A number of biographers have taken great pains to research the lives of internationally recognized innovators or creators, in an attempt to identify and describe those attributes which have distinguished acknowledged creative producers from the great mass of humanity (cf., Drevdahl, 1956; MacKinnon, 1962; Roe, 1953).

However, biographical studies are often fraught with ambiguity. It remains to be proven that the "Eureka phenomenon" and the peculiar personality characteristics identified and emphasized by the biographers are really those conditions which are necessary for creativity. For example, great emphasis has been laid upon the tension within the innovator during the creative act culminating in a sudden solidification of Gestalt, the social withdrawal and rejection of others, and his general irritibility. On the contrary, it may be that the creative act is a slow and arduous reorganization of ideas or that the stressed personality characteristics exist just as commonly in noncreative individuals but are not as strongly emphasized in their biographies. Finally, other people in the general population may have as much, or even more of particular talents necessary for creative production, but lack other conditions which must synthesize with existent ones to allow

potential creativity to emerge. A good example of such a characteristic may be that of persistence, one of the widely accepted criteria for creativity. Persistence without the other creative talents certainly is insufficient for creative production, but the opposite may also be true, that potential creative ability without persistence may never allow the emergence of the potential.

Yet, biographies of creative innovators may yield valuable clues which can be followed up in laboratory or classroom studies. But follow up is impossible until some common agreement on the definition of the concept of creativity is reached.

Ausubel (1964) for example, defined the creative individual as one who "must make, or be capable of making, a uniquely different discovery that is different in kind from ordinary expressions of creativity (p. 344)". This definition precludes the study of the creative individual in a laboratory or classroom situation, for how can one, in a controlled environment, working with a sample of 100 or 1000 pupils, hope to stumble over the un'quely different creative individual? And, how is one to recognize that this creative product is different in kind from ordinary expressions of creativity? Therefore, laboratory and other controlled classroom studies must, perforce, limit themselves to the assessment of "ordinary expressions of creativity", i.e., the identification of a response in a structured sample of stimulation which is original <u>within the sample of subjects studied</u>. This may, of course, distort the meaning of creativity in another direction, for it assumes that creativity is normally distributed throughout the population and that any random sample may include a share of the upper portion of the distribution.

The gain from this approach is in the ability to locate all the members of the sample along a continuum of creativity. Since most of the other characteristics whose existence one wishes to identify are also measurable along a continuum, one has the opportunity to examine the possible concurrence of some or all of these characteristics, together with originality of response.

In a number of research centres in the U.S.A. psychologists have examined large groups of people with the goal of discovering those personality traits which correlate with creativity. For example, Barron at Berkeley, described the person with the disposition towards creativity as more observant, independent in his cognitions, having a greater brain capacity which allows him to make richer syntheses; more sensitive and possessing a stronger ego (Barron, 1963b). In another paper, he presented results which suggested that the "Simple Person" (one who prefers low-complex and symmetrical stimulation) is inflexible of thought, manner, stubborn, pedantic, unbending, ethnocentric and politically conservative, while the "Complex Person" (one with a high disposition towards creativity) tends to be a social, dissident, pessimistic, impulsive, independent of judgment and with a high personal tempo (Barron, 1963a).

Research into the area of curiosity, both as a motivational factor and as a personality trait, has led the senior author to compare closely Berlyne's description of curiosity (Berlyne, 1960, 1963) with one of Barron's measures of creativity, the Barron-Welsh Art Scale (BWAS). From the results of a number of experiments, there are reasonable grounds for believing that both Barron and Berlyne are dealing with similar concepts and using similar stimulus materials, while naming the response differently; Berlyne calling preference for complexity and asymmetry the disposition to be curious, and Barron naming preference for complexity and asymmetry as part of the disposition to be creative.

Many of the studies which seek to identify personality correlates of creativity have focused upon the relationship of intelligence to creativity. The research has been too extensive to be reviewed here, but the results have generally been equivocal and inconclusive. While some have found no correlation of the two measures (cf. Wallach and Kogan, 1965) others (cf. MacKinnon, 1962) argue that there is a correlation over the entire ranges of intelligence and creativity, but that the magnitude of the correlations varies greatly at different levels of intelligence. It is generally accepted that creativity and intelligence may become independent only after some relatively high IQ level has been exceeded (cf. Taylor, 1964; Vernon, 1964). Thus, we are led to the conclusion that intelligence may be a necessary condition for creativity and that creative potential requires a minimal level of intelligence.

Research into the relationship between curiosity and creativity has been summarized in a paper by the senior author (Day, 1968a). He pointed to findings of positive correlations between scores of various tests of curiosity with scores of various tests of creativity. Some of the difficulties in achieving such positive correlations regularly were also outlined.

Day has been able to find positive significant correlations between one measure of perceptual specific curiosity (Day, 1968b) and Barron-Welsh Art Scale scores fairly consistently. Partly, this results from the fact that both of these tests use visual stimulus materials varying along the dimensions of complexity and symmetry/asymmetry. But attempts to extend the measure from the perceptual to the cognitive and conceptual areas has not always been as successful. This may be due to the vagueness and ambiguity in the definitions of both concepts and to the resultant lack of consentual agreement in the test to be used. Finally, the

relationship between curiosity and intelligence has also been considered by the senior author (Day, 1968a). He summarized the data by showing that, in children, test scores of these concepts tend to be uncorrelated and suggested that they are independent conditions both necessary for creativity. He continued by suggesting that with increasing maturity and reinforcement for curious and intellectual behavior, these two conditions for creativity may, indeed, become correlated in adult subjects.

These earlier findings led to the following hypotheses:

1) That in an adult sample of subjects there would be a tendency towards a positive correlation between curiosity and intelligence, but this would not be significant;
2) Since the sample of subjects varied in intelligence, but probably did not reach an extremely high level, there would be a significant positive correlation between IQ and creativity;
3) That there would be a significant positive correlation between curiosity and creativity.

## METHOD

### Subjects

The Ss were 75 female nursing students taking an introductory psychology course at a local hospital. The Ss participated in this study as part of their course.

### Materials

Two tests of curiosity were administered, two tests of creativity and one intelligence test. One test of curiosity was the Perceptual Specific Curiosity

Scale developed by the senior author (Day, 1968a). The second was a specific curiosity questionnaire now being standardized by the senior author (Day, 1968b) creativity tests were Mednick's Remote Association test (Mednick and Mednick, 1964)and a test which required the writing of humorous captions for 12 TAT cards (cards 1, 2, 3BM, 8BM, 12F, 13B, 17BM, 4, 7GF, 9BM, 10, 7BM). The intelligence test used was the Hartford-Shipley Aptitude Test (Sines and Simmons, 1958, 1959)

Procedure

The Ss were tested in their regular classroom during a class period by their usual instructor. Standard instructions on the RAT were read and 30 minutes were allotted for the completion of the test. Then the TAT cards were projected onto a screen with the following instructions:

> "You are about to see a series of 12 pictures, for which we would like you to add a humorous or funny caption. Perhaps you have seen famous works of art, especially paintings with captions added. There are also political cartoons like this". (An example was given from a currently popular book).
> "You will have one minute for each caption. Write down whatever appeals to your humour. Your names do not appear on the sheet, so write freely whatever you choose".

Then the 28 figures of the Specific Curiosity Scale were projected on the screen and Ss were required to rate each of the items along a 7-point scale of interestingness. This was followed by a short break and then the Hartford-

Shipley Aptitude Test was administered with the standard 20-minute time limit. Finally, the Specific Curiosity Questionnaire was administered.

## RESULTS

The TAT humour captions were scored separately by three judges and inter-judge reliability was established (r = .86). The data for all the tests were correlated and are presented in Table 1.

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Insert Table 1 about here

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The results clearly show that the two tests of creativity correlate significantly.

On the basis of earlier studies using the two tests of curiosity, a significant correlation was not expected, for curiosity in the perceptual mode is but one portion of total specific curiosity and the number of questions which deal with the perceptual area is very few. Neither test scores correlated with total IQ scores, although both correlated with the verbal subtest scores. Questionnaire scores correlated with Remote Association Test scores, but not with the TAT humour caption scores.

## DISCUSSION

As postulated, curiosity and IQ scores failed to correlate significantly, although the tendency to do so was apparently in a positive direction and indeed both curiosity test scores correlated with the verbal portion of the Hartford-Shipley. This latter finding is in accord with earlier findings of a positive correlation of Questionnaire scores with verbal subscores on the WISC.

IQ scores were correlated with RAT scores but not with TAT captions. The former correlation was expected since IQ scores were spread across the nurmal range (the mean IQ for the group was 116 and the range 104 to 127). Unfortunately, humorous captions were very sparse, possibly because of task difficulty, as well as the limitations of time (one minute per picture). Frequently the captions related to TV advertisements or currently popular expressions.

Curiosity questionnaire scores correlated with RAT scores as predicted. This adds credence to the argument that curiosity and creativity are related concepts.

In summary, then, the conclusions from this study must be that intelligence and curiosity are independently related to creative production in the Remote Associations Test, a widely accepted measure of creativity.

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TABLE I

Coefficients of correlation of all the tests(N = 75)

| | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 1 | .241* | -.023 | .329** | .128 | .191 | .212 |
| 2 | — | .388** | .300** | .294* | .188 | .470** |
| 3 | | — | .065 | -.076 | -.024 | .724** |
| 4 | | | — | .154 | .262* | .735** |
| 5 | | | | — | .123 | .055 |
| 6 | | | | | — | .165 |

* significant at .05 level
** significant at .01 level

1. Specific Curiosity Questionnaire
2. Remote Associations Test
3. Hartford-Shipley Aptitude Subtest
4. Hartford-Shipley Verbal Subtest
5. TAT Humour Captions
6. Perceptual Curiosity Test
7. Total Hartford-Shipley (IQ)