The Relationship between Achievement Motivation

and Serum Uric Acid Values

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The fact that men of higher status have higher levels of uric acid in the blood suggests that this substance may be associated with the motivation to achieve. In a study of college professors, serum uric acid correlated very highly ($r = .66$) with a measure of achievement orientation (French, Tupper & Mueller, 1965; Brooks & Mueller, 1966). This measure, obtained from coding interviews about their jobs, consisted of several sub-scores including "drive", "achievement", "range of activities", and "leadership". This post hoc measure of achievement orientation obviously contained motivational components as well as behavioral components, but there was no way of proving that serum uric acid was associated with achievement motivation as measured by a standardized and validated test. Indeed Kasl et al. (1966) emphasized the behavioral correlates because they were able to predict, four years in advance, the achievement behavior (going to college and the number of years of college completed) of high school students on the basis of their serum uric acid.

It is the purpose of this study to test the hypothesis that serum uric acid is related to a standardized measure of achievement motivation. We have chosen Heckhausen's test of need for achievement, a modification of the TAT measure used by Atkinson and his co-workers. This test was selected because it is a standardized test which yields separate scores for the approach component ("hope for success") and the avoidance component ("fear of failure"). We hypothesize that serum uric acid will
be positively related to the former and negatively related to the latter.

**Method**

The design of the study compared achievement motivation in a test group known to be high in serum uric acid with a comparison group assumed to be normal in uric acid. The high uric acid group consisted of 30 male outpatients diagnosed as having gout on the basis of having serum uric acid levels above 7.0 mg./100 ml.; the comparison group consisted of 49 subjects of Heckhausen's normal standardization group assumed to have much lower levels of serum uric acid. This normal comparison group probably had a mean serum uric acid of about 5.2 mg./100 ml.; and there was probably very little overlap between the two groups.

In the test group the serum uric acid was determined by the enzymatic spectrophotometric method of Bretorius (1962), a modification of the method proposed by Liddle et al. (1959). The technical error of the former method is 0.01 mg./100 ml.

The Heckhausen test was administered to the test group in the hospital. The subjects were invited to participate by the physician who was treating them, and 100% of them volunteered. The medical setting and the relaxed manner of the tester succeeded in creating a free and easy atmosphere so that all subjects seemed to cooperate willingly.

Heckhausen's TAT-like test consists of six pictures, three designed to stimulate hope for success and three intended to arouse fear of failure. A story is told to each picture, and each story is coded for hope for success and fear of failure. The summation of the two scores yields the index for 'total motivation' (Gesamtmotivation). Subtracting the fear of failure score from the hope for success score gives the
index for net hope for success (Netto-Hoffnung). For a further evaluation of this measure we direct the reader to the relevant publication (Heckhausen, 1963).

After completing the training course provided by Heckhausen (1963), a team of two students who did not know the uric acid values of the subjects coded the stories in cooperation with each other. These results were checked against the independent coding done by a third student who worked without knowledge of the uric acid values and the hypotheses of the study. The correlations from this reliability check were .86 for hope for success, .82 for fear of failure, .85 for net hope for success, and .90 for total motivation. The achieved reliability of coding seems very good indeed. We use as data for this investigation the scores of the team of coders since these data represent the outcome of the cooperation among two people, and thus seem more trustworthy than the work of the single check-coder.

Thus we have reliable measures of achievement motivation for a test group and for a comparison group which surely differ greatly in uric acid. The decisive methodological question is whether these two groups might differ in some other way which is correlated with the difference in uric acid and thus confounds the results. The following description of the two groups examines this possibility.

**The test group.** This sample consisted of 30 male gout patients at the university clinic having high levels of serum uric acid (more than 7.0 mg./100 ml.). The subjects fulfilled the following criteria. (1) We chose only male subjects, since these are the only ones considered in the literature so far; and males differ from females in both uric acid and achievement motivation. (2) The subjects were between 25 and 60 years
of age. Dunn et al. (1963) had found that in this age range the uric acid concentration is relatively constant. (3) The subjects had to be working, i.e., the gout was not to interfere with normal living since that might have influenced the subjects' need for achievement in an uncontrolled way. The mean serum uric acid level of our subjects was 8.48 mg./100 ml., and ranged from 7.0 to 12.7 mg./100 ml. with a standard deviation of 1.27 mg./100 ml. The sample consisted of 13 craftsmen, 14 white collar workers, and 3 managers. Twenty-four had an 8th grade education, one had 10 years of schooling, and the remaining five had 12 years. All subjects were married.

The comparison group. In this study we did not have the resources to select our own comparison group, comparable in all respects but the level of the uric acid concentration. We were forced to choose as a comparison group one of those described in the literature. The most suitable one seemed to be a group used by Heckhausen to standardize his test. This group was characterized by Heckhausen (1963, p. 69-70) as follows: The subjects were 46 male and 3 female students of a training institute for social workers. The average age was 31 years with a range from 23 to 50. All students had prior occupations; 36 were craftsmen and 13 were white collar workers. They represent a selection from a greater number of applicants for this training. All have at least an 8th grade education.

The two groups are roughly comparable with respect to age and educational level. They differ, however, with respect to illness, occupational striving and achievement, and sex. We believe that the possible confounding effects of these differences tend to cancel each other. The comparison group might be slightly low on achievement moti-
vation because it contains 3 women, but this should be more than offset by their striving for occupational advancement through training. Similarly the test group might be low on achievement motivation because of their illness but this should be more than offset by their higher occupational status. Despite the imperfect matching we believe that differences between the test group and the comparison group in achievement motivation can best be attributed to differences in serum uric acid.

Results

The major hypotheses predicted that the test group would be higher than the comparison group on hope for success and lower on fear of failure. It follows that the test group should also be higher on net hope for success (i.e., hope for success minus fear of failure). No difference was expected on total motivation (i.e., hope for success plus fear of failure).

The relevant data are presented in Table 1.

<table>
<thead>
<tr>
<th>Achievement Motives</th>
<th>Test Group</th>
<th>Comparison Group</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hope for Success</td>
<td>8.00</td>
<td>6.33</td>
<td>2.46</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Fear of Failure</td>
<td>3.77</td>
<td>6.18</td>
<td>3.18</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Net Hope Success</td>
<td>4.23</td>
<td>.15</td>
<td>3.34</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Total Motivation</td>
<td>11.77</td>
<td>12.51</td>
<td>.96</td>
<td>&gt;.05</td>
</tr>
</tbody>
</table>

Table 1. Mean scores on the achievement motives for the test group compared to the control group.

As predicted, the test group with high serum uric acid is significantly higher than the normal comparison group on hope for success (P < .05). Also the test group is lower on fear of failure (P < .01). Therefore
the test group is higher on net hope for success (P < .01). But there is no difference between the two groups on total motivation. The amount of variance accounted for in these four comparisons (estimated by the omega measure proposed by Hays, 1963) is 6%, 10%, 11% and 0% respectively.

Discussion

The data presented in Table 1 are based on blind analyses using measures with high reliability. The results are clearly and significantly as predicted on the basis of the higher serum uric acid in the test group. However, these same results might have been predicted on the basis of small differences in occupational status and sex, though the illness in the test group and the presumed occupational strivings in the comparison group might lead to opposite predictions. On the whole we conclude that there is substantial support for the hypothesis that serum uric acid is positively related to hope for success and negatively related to fear of failure. The small amount of variance accounted for is not surprising in view of the number of uncontrolled variables.

The finding that the two groups did not differ in total motivation is best interpreted with reference to a recent study which distinguished a general factor and a bipolar factor in achievement motivation (Bäumler & Weiss, 1967). The general factor loads on both hope for success and fear of failure; and this total motivation correlates with performance on simple speed tasks. On the other hand, the bipolar factor which corresponds to net hope for success predicts to goal-setting behavior.

Our findings indicate that this net hope for success factor has serum
uric acid as a physiological correlate. Thus we would expect uric acid to predict to a preference for intermediate risks and a tendency to approach rather than to avoid achievement situations.

This expectation was tested in a separate study. A factor analysis of the Achievement Risk Preference Scale of Atkinson and O'Connor yielded two meaningful factors: a preference for intermediate rather than high risks and a tendency to approach rather than avoid achievement situations. Scores on each of these two factors were correlated with serum uric acid; and the resulting correlations were not significant. These negative findings we attribute to low validity of the factor scores because we know that they do not relate to achievement orientation as coded from interviews (French, Tupper & Mueller, 1965) and it is known that the total score on the Achievement Risk Preference Scale does not correlate with the TAT measure of need for achievement.

It is clear that serum uric acid is related to achievement and to some measures of achievement motivation. It is equally clear that more research is needed on how uric acid relates to Atkinson's TAT measure of achievement motivation as well as to a wider variety of achievement behaviors. We are currently engaged in such research.

References


