Rapid Communication
Whole Blood Serotonin and the Type A Behavior Pattern

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In 72 young males, whole blood serotonin is shown to have a pronounced relationship with the Type A behavior pattern. The relationship is explored with multivariate statistical techniques.

INTRODUCTION

Blood serotonin has been implicated in the outcome of social competition in nonhuman primates (1–3). However, there has been no published work testing for comparable involvement in the social competition of humans. This study presents evidence of such involvement with one particular competitive disposition, the Type A behavior pattern.

MATERIALS AND METHODS

The subjects were 72 healthy male undergraduates. On the appointed day, each reported to the hospital at 4:30 PM, having refrained from smoking, eating, or drinking (except water) after the noon meal. An indwelling heparinized catheter was placed in the antecubital vein to permit eleven timed blood samples (all but one of which were to be used in other investigations). Each subject was given a standard dinner. He then completed a questionnaire focusing primarily but not exclusively on Type A behavior. This was tapped by 20 items drawn from Glass's student version of the Jenkins Activity Survey (JAS) (4). However, response options for all questionnaire items were modified to permit magnitude (rather than category) scaling and thus, interval level measurement (5–7). Subsidiary questionnaire concerns were sense of control over the events of life (8), usual anxiety level (9), and trust of others.

The 10 ml blood sample for this study, last in the series of samples, was drawn into a tube containing edetic acid (EDTA), immediately frozen and stored at −70°C. When all samples for the study had been collected, they were packed in solid carbon dioxide and sent by overnight express to UCLA where whole blood serotonin (WBS) was assayed by the procedure of Yuwiler et al. (10).

RESULTS

The serotonin values (ng/ml) were normally distributed ($\bar{x}$ = 146, s = 49) and ranged from 40 to 295. Orthogonal factor analysis of the Type A data successfully reproduced the H (hard-driving) and S (impatience) dimensions found by Zyzanski and Jenkins in their orthogonal factoring of the full set of JAS items, and with much higher communalities for the defining measures (11). Glass, using the student JAS, also had found these dimensions (4).

Significant covariation was found be-

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tween WBS and a number of the questionnaire items. However, inspection of scatter diagrams showed that in most instances the relationships with the Type A items were not linear and depended heavily on the more extreme values at the upper end of the distributions. To reflect that curve, these items were rescaled with the lower two-thirds of their distributions scored zero and the upper third scored one.

The product-moment correlation for each Type A item having a significant relationship with WBS is presented in Table 1. Also shown is one item not from the student JAS, but which in conceptual terms is plainly not foreign to the Type A construct. This item assesses self-confidence. (The strength of its empirical tie with the Type A behavior pattern is shown by a multiple correlation of 0.71 when this variable is regressed on three of the Type A items shown in Table 1.)

Multiple-item measures were tested, with these results: when the Type A measures were left in continuous form neither a summed index, a first principal component, nor the orthogonal dimensions described above show a relationship with WBS as great as the correlations for most of the individual items given in Table 1. However, when they were rescaled as dichotomies and refactored (with an oblique rotation), the three emergent measures, "Speed," "Impatience," and "Competitiveness," correlate with WBS at +0.41, +0.44, and +0.33, respectively. Regressing WBS on these three measures, resulted in a multiple correlation (adjusted for degrees of freedom) of 0.49.

Composite measures of anxiety and of sense of personal control, whether items were weighted in a factor analysis or unweighted in simple indexes, were not related to serotonin level.

Further exploration of these data using several regression analysis techniques showed that the Type A items, taken in one or another combination, could push the multiple correlation with WBS as high as 0.70, though values closer to 0.60 were more typical. These were purely empirical forays, the detailed coefficients for which are not important. The point is only to show in this preliminary body of evidence just how strong the Type A relationship with WBS may be.

DISCUSSION

These findings are unlikely to depend in any significant way upon the context in

TABLE 1. Correlations of Whole Blood Serotonin with Type A Measures

I probably eat faster than I should:	0.364*
It makes me angry when people are late for appointments:	0.363*
I have more willpower than most people seem to have:	0.335*
I lose patience with speakers who don't get to the point.	0.322*
I get a bit angry with people who can't understand simple ideas:	0.320*
I am more responsible than most college students:	0.272*
I plan to find a career that is difficult and challenging:	0.267
I often set deadlines for myself:	0.258*
I find competition stimulating:	0.251*
Everyday life is filled with challenges to be met:	0.249*
Normally I feel self-confident:	0.340*

All correlations are significant at $p < 0.05$. Coefficients marked with * indicate the variable has been rescaled as a dichotomy. The last item is not from the student version of the JAS.

which they were generated. The evidence indicates that both WBS and the Type A pattern are stable over periods of at least several weeks and probably much more (12, 13).

Yuwiler (14), in reviewing the relationship between stress and serotonin, suggests that the serotonergic system may be a mechanism setting emotional tone rather than one showing immediate situational response. Although peripheral parameters have an uncertain relationship with physiologic serotonergic activity, the results from this study tempt the conclusion that WBS provides a biochemical marker for one manifestation of such emotional tone—i.e., the Type A behavior pattern (and especially its speed-impatience elements). Plainly, any final judgement at this point would be premature. In further tests of this relationship priority must be given to better empirical specification of the various components of the Type A pattern.

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