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AUTHOR Marrone, Joseph G.
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ABSTRACT

Recent discussions of sex differences in intellectual abilities concur that such cognitive sex differences are statistically reliable yet small. To examine the variables of anxiety, rigidity, and divergent production, and to demonstrate that meaningful interactions involving the sex variable may be revealed when there are no "simple" sex differences on any of these variables, and that the magnitude of these effects is not inconsequential, subjects (N=275) completed the State-Trait Anxiety Inventory (STAI) as well as a 49-item self-report measure of rigidity. Results indicated that complex interactions involving the sex variable were possible even when no "simple" sex differences occurred in the dimensions examined. The findings suggest that the current trend toward more careful appraisals of reported sex differences may be a genuine step forward. (PAS)

# Personality Mediators of Sex Differences in Divergent Production

Joseph G. Marrone

Siena College

This paper reports data which have important implications relevant to recent discussions of cognitive sex differences focusing on the magnitude of effects. The recent literature reveals a movement toward closer scrutiny and increased caution in the interpretation of reported sex differences in intellectual abilities (Sherman, 1978; Peterson and Wittig, 1979; Hyde, 1981). Maccoby and Jacklin (1974) concluded that there were some "well-established" sex differences in cognitive abilities, specifically that women were superior in verbal tasks and men excelled in visual-spatial and mathematical tasks. Recently, Hyde (1981) re-examined the literature reviewed by Maccoby and Jacklin (1974) on cognitive sex differences by applying meta-analytic techniques. Hyde (1981) concluded that, while the effects in question are "statistically reliable and replicable," they are in fact small, as sex-group membership, per se, accounted for very little (1% to 5%) of the performance variance (p. 895).

Warnings of this sort are not new as they echo conclusions expressed over the years by authorities in the study of individual differences (e.g., Terman and Tyler, 1954; Anastasi, 1958) including Maccoby and Jacklin themselves. Men and women it seems are more alike than they are different. What is new perhaps is renewed vigor in attention to methodological detail coupled with the advent of more systematic and refined techniques for the examination of whole research areas. The latter developments underscore critical problems in the interpretation

of sex differences and call for heightened sensitivity to the implications of such differences.

Problems abound in the establishment and interpretation of sex differences, to be sure; and these concerns ought to be well taken. Nevertheless, it seems that even if simple, straightforward sex differences in cognitive abilities with practical significance are not to be revealed; this does not preclude the possibility that there may be meaningful and important interactions involving the sex variable.

The purpose of this paper is to demonstrate (1) that meaningful and significant interactions involving the sex variable may be revealed even when there are no "simple" sex differences on any of the variables examined, and (2) that the magnitude of these effects is not inconsequential.

Anxiety, rigidity, and divergent production were chosen for study because there are no simple sex differences on these variables and, based on some of Maccoby's (1966) early speculations about personality mediators of intellectual performance in men and women, it seemed reasonable to anticipate that interactions might emerge. It should be noted at this point that higher levels of anxiety have been reported fairly consistently for women as compared to men (Maccoby and Jacklin, 1974). However, this difference undoubtedly depends on the particular anxiety measure used and, in any event, is not well understood. The authors of the State-Trait Anxiety Inventory (STAI) which was used in this study reported no sex differences in generalized anxiety (Spielberger, Gorsuch, and Lushene, 1970).

## Method

### Subjects

The subjects were 275 men and women ranging in age from 17 to 22 who were contacted during regular meetings of general psychology sections. The subjects were invited to participate in the absence of their instructor to provide them with a realistic opportunity to decline. The subjects were told at this time that some of them might be contacted at a future date for additional testing and that, if they chose to participate further in the study, they would have a chance to win one of five $25 cash prizes to be raffled off at the end of the experiment. The latter technique was employed not only to induce participation but also as a token expression of gratitude for their time and effort.

### Procedure

The initial sample of 275 men and women were screened on the Trait form (A-Trait) of the STAI as well as a 49-item self-report measure of rigidity developed by Braen (1960). A fairly large sample of subjects was initially screened so that the full range of anxiety and rigidity scores would be represented in the subsequent formation of anxiety-rigidity subgroups.

The formation of experimental groups (as well as the corresponding raw score cutoffs employed) proceeded as follows. The sample was reduced to 36 men and 36 women by selecting from the original pool 6 men and 6 women to represent each of three

anxiety levels: High (43 and above), Medium (36 to 39), and Low (32 and below), coupled with each of two rigidity levels: High (31 and above) and Low (24 and below). Thus, the design was a 2 by 2 by 3 factorial, with 12 experimental groups formed by combining the three levels of anxiety with two levels of rigidity along with the sex classification. The groups so formed represented the upper 31% and lower 33% of the obtained distribution of rigidity scores, and the upper 24%, middle 20%, and lower 22% of the obtained distribution of A-Trait scores.

These 72 subjects were contacted and invited to participate further. None declined, and appointments were made for a final individual testing session. Each subject entered a quiet testing room and filled out the State form (A-State) of the STAI followed by three measures of divergent production from the Guilford battery: Ideational Fluency, Utility, and Consequences. The latter are measures of fluency, spontaneous flexibility, and originality, respectively (Guilford and Hoepfner, 1971). Each subject also gave written permission for the release of their Scholastic Aptitude Test (SAT) scores. When the testing was completed each subject was given the opportunity to ask questions and was debriefed. After the data had been collected from all subjects, the raffle was held and the cash prizes were distirbuted.

The measures of divergent production were scored according to standard practice. The Consequences Test protocols, scored for originality, were rated blind by four raters, the investigator and three advanced psychology graduate students. Scoring

guidelines as well as sample test protocols were provided for practice scoring so that the relevant response criteria could be mutually agreed upon and understood. This technique worked well as the inter-rater reliabilities for the originality scores ranged from .89 to .94. Since the intercorrelations were so high, one rater's scores were designated at random for use in subsequent analyses.

## Results

The data were analyzed by means of three-way analyses of variance and covariance involving the A-Trait, Rigidity, and Sex classifications. Parallel analyses of the same form were carried out with subjects re-classified on the basis of A-State scores. SAT scores were introduced in these analyses as statistical covariates, however, in no instance did this procedure alter the pattern of results, and these analyses will not be discussed further. All analyses were carried out on square-root-transformed scores.

A consistent pattern of relationship between A-State levels and each of the three measures of divergent production emerged with Low A-State resulting in significantly higher levels of performance than Medium or High A-State, which did not differ from each other ($p<.05$). Interesting interaction effects also emerged for two of the three divergent production measures, Ideational Fluency and Consequences.

Analysis of Ideational Fluency test scores revealed a main effect of A-Trait ($F$ (2,60)=3.185, MSe=.826, $p<.05$), however, the A-Trait effect was moderated by the Sex factor ($F$ (2,60) =5.102, MSe=.826, $p<.01$). This interaction is depicted in

Figure 1 which shows that Medium A-Trait is associated with optimal performance in men, while Low A-Trait is associated with optimal performance in women.

In addition, analysis of Consequences Test originality scores revealed a Rigidity by A-State interaction ($F$ (2,60)= 4.046, MSe=1.007, $p<.05$) as well as a Rigidity by A-State by Sex interaction ($F$ (2,60)=4.963, MSe=1.007, $p<.05$). The complex nature of this interaction is displayed in Figure 2. The general trend in these data associates lower levels of A-State with higher originality scores. However, this generalization is complicated by the presence of two distinct elements in the data which seem to produce the interaction. First, a rather symmetrical reversal of the effect of High and Low Rigidity is evident for the sexes. Generally, Low Rigidity is associated with higher levels of originality in men but lower originality in women. Second, the latter generalization itself breaks down when the High A-State groups are considered. Thus, the combination of High A-State coupled with opposite effects of Rigidity level for the sexes produces the interaction.

The latter results demonstrate that complex interactions involving the sex variable are possible even when no "simple" sex differences occur in the dimensions examined. Yet, how large are these subgroup differences? A meta-analytic technique described by Hyde (1981) was used to evaluate the magnitude of these effects. This procedure involves calculation of the $d$

statistic which is the ratio of the difference between subgroup means to the standard deviation of the entire group. Interpretive guidelines suggested by Cohen (1969) consider a d of about .20 to indicate a slight difference, a d of .50 to reflect a moderate difference, and a d value greater than .80 to indicate a large difference. The results of these analyses are summarized in Tables 1 and 2 which display the d values for all between-sex contrasts of subgroups represented in Figures 1 and 2, respectively. These data show clearly that the magnitude of the differences among most of the subgroups is substantial. For example, Table 2 reveals that the contrast between High Rigid-High Anxious (HRHA) women and Low Rigid-Low Anxious (LRLA) men resulted in d = 1.44, which means that these groups are 1.44 SD's apart in originality scores. In fact, closer inspection of these data reveals that 8 of the 9 d values in Table 1 are greater than .50, and 20 of the 36 d values in Table 2 exceed .50; far more than might be expected on the basis of chance.

## Discussion

The results of this investigation indicate that we should take a closer look at personality mediators of cognitive sex differences. Moreover, it was demonstrated that complex interactions involving the sex variable are possible even when no "simple" sex differences are evident, and that these effects may be substantial. In addition, the effects in question are not necessarily meaningless and uninterpretable.

For example, the A-Trait by Sex interaction reported here is quite consistent with data reported elsewhere. In fact, such

an interaction might even have been predicted. The relationship between anxiety and intellectual performance seems to differ for men and women (Maccoby, 1966). Negative correlations have consistently been found for women, while for men the relationship is at best ambiguous, with positive, negative, and zero correlations reported. If one assumes that there is an inverted u-shaped relationship between anxiety and intellectual performance in men, then the inconsistency in the literature may merely reflect methodological differences. One would find any of the relationships noted depending on the real segments of the anxiety continuum examined in a particular study. High, medium, and low anxiety, after all, are relative terms whose meaning may vary with the characteristics of the sample tested, the score cutoffs, as well as the particular instrument used. The latter variables might also be expected to interact with the conditions of testing. It is not surprising that inconsistencies arise. Care was taken in this study to sample from the entire normal range of anxiety scores and the results are sensible in terms of data reported previously.

The second interaction involving Rigidity, A-State, and Sex is admittedly more difficult to interpret. What is particularly striking about this effect is its symmetry. High Rigid men performed similarly to Low Rigid women, and the performance of Low Rigid men paralleled that of High Rigid women. Additional research is necessary to explain how High Rigid men are similar to Low Rigid women, and Low Rigid men are similar to High Rigid women. However, aside from substantive interpretation, what this effect suggests, perhaps, is that we must

consider the possibility that this construct may have a different meaning for men and women. This, of course, raises serious questions about the real referents of the construct, and underscores the need for more focused study to clarify its meaning for the sexes.

The present trend toward more careful appraisal of reported sex differences is a genuine step forward. At the same time, however, if we allow a bias against sex differences to color our perspective, it may well be a dangerous step in that it may lead to a complacency which only serves to divert us from the very issue. We may be lulled into accepting the idea that the work is done while at the same time we are blinded to the reality that in certain respects it is just beginning.

Whatever differences between the sexes which are known to exist or which have yet to be discovered, are likely to have come about by most intricate and subtle pathways in development. Why would anyone expect a characteristic as complicated as sex to manifest itself in any but the most complex ways?

References

Anastasi, A. Differential Psychology. (3rd ed.). New York: Macmillan, 1958.

Braen, B.B. Development of a theoretically based manifest rigidity inventory. Psychological Reports, 1960, 6, 75-88.

Cohen, J. Statistical power analysis for the behavioral sciences. New York: Academic Press, 1969.

Guilford, J.P., & Hoepfner, R. The analysis of intelligence. New York: McGraw-Hill, 1971.

Hyde, J.S. How large are cognitive gender differences? American Psychologist, 1981, 36, 892-901.

Maccoby, E.E. Sex differences in intellectual functioning. In E.E. Maccoby (Ed.), The development of sex differences. Stanford, CA.: Stanford University Press, 1966.

Maccoby, E.E., & Jacklin, C.N. The psychology of sex differences. Stanford, CA.: Stanford University Press, 1974.

Peterson, A.C., & Wittig, M.A. Sex-related differences in cognitive functioning: An overview. In A.C. Peterson and M.A. Wittig (Eds.), Sex-related differences in cognitive functioning. New York: Academic Press, 1979.

Sherman, J. Sex-related cognitive differences. Springfield, IL.: Charles C Thomas, 1978.

Spielberger, C.D., Gorsuch, R.L., & Lushene, R.E. STAI Manual. Palo Alto, CA.: Consulting Psychologists Press, 1970.

Terman, L.M., & Tyler, L.E. Psychological sex differences. In L. Carmichael (Ed.), Manual of child psychology. (2nd ed.). New York: Wiley, 1954.

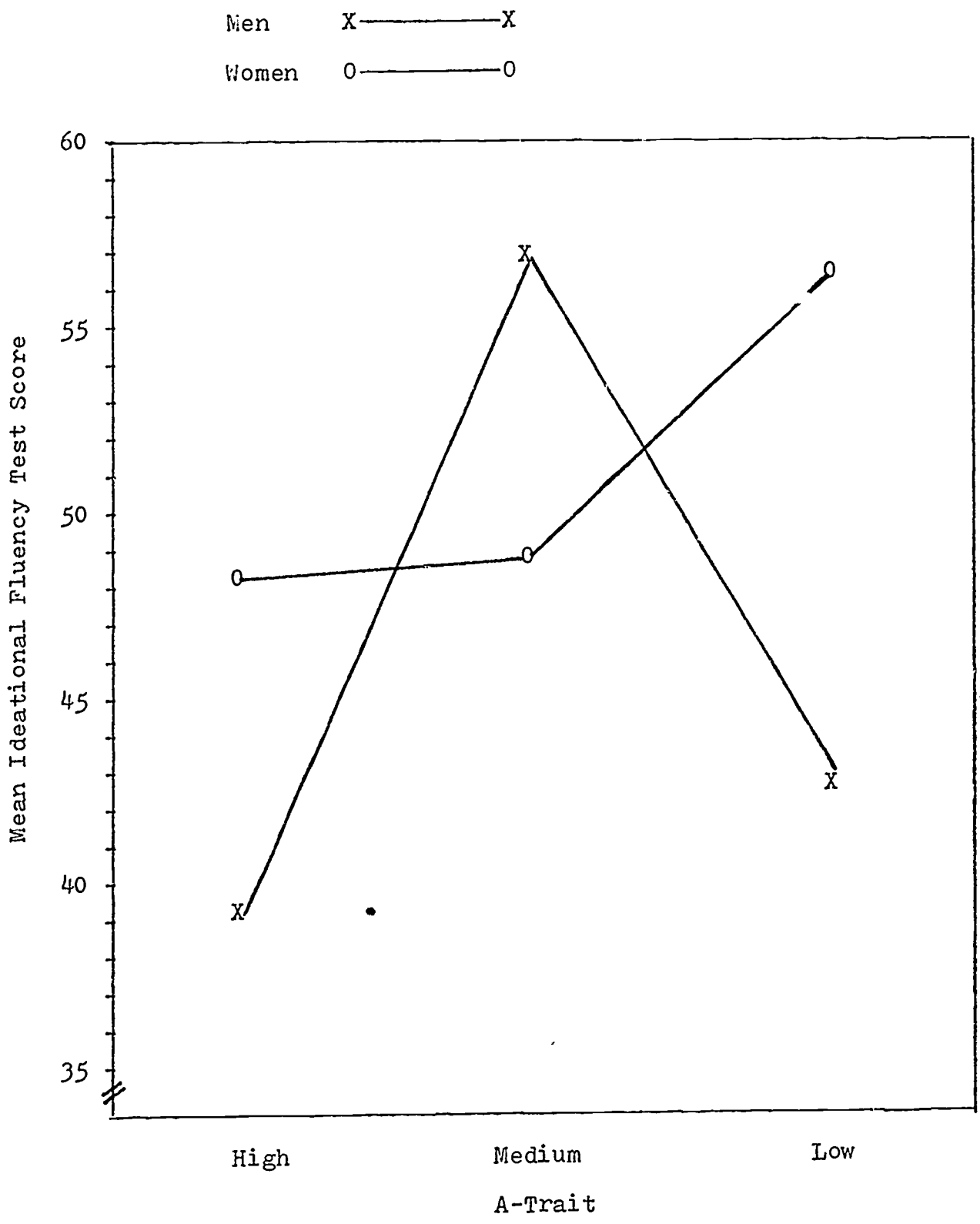


Figure 1. Ideational Fluency Test scores of men and women as a function of A-Trait level.

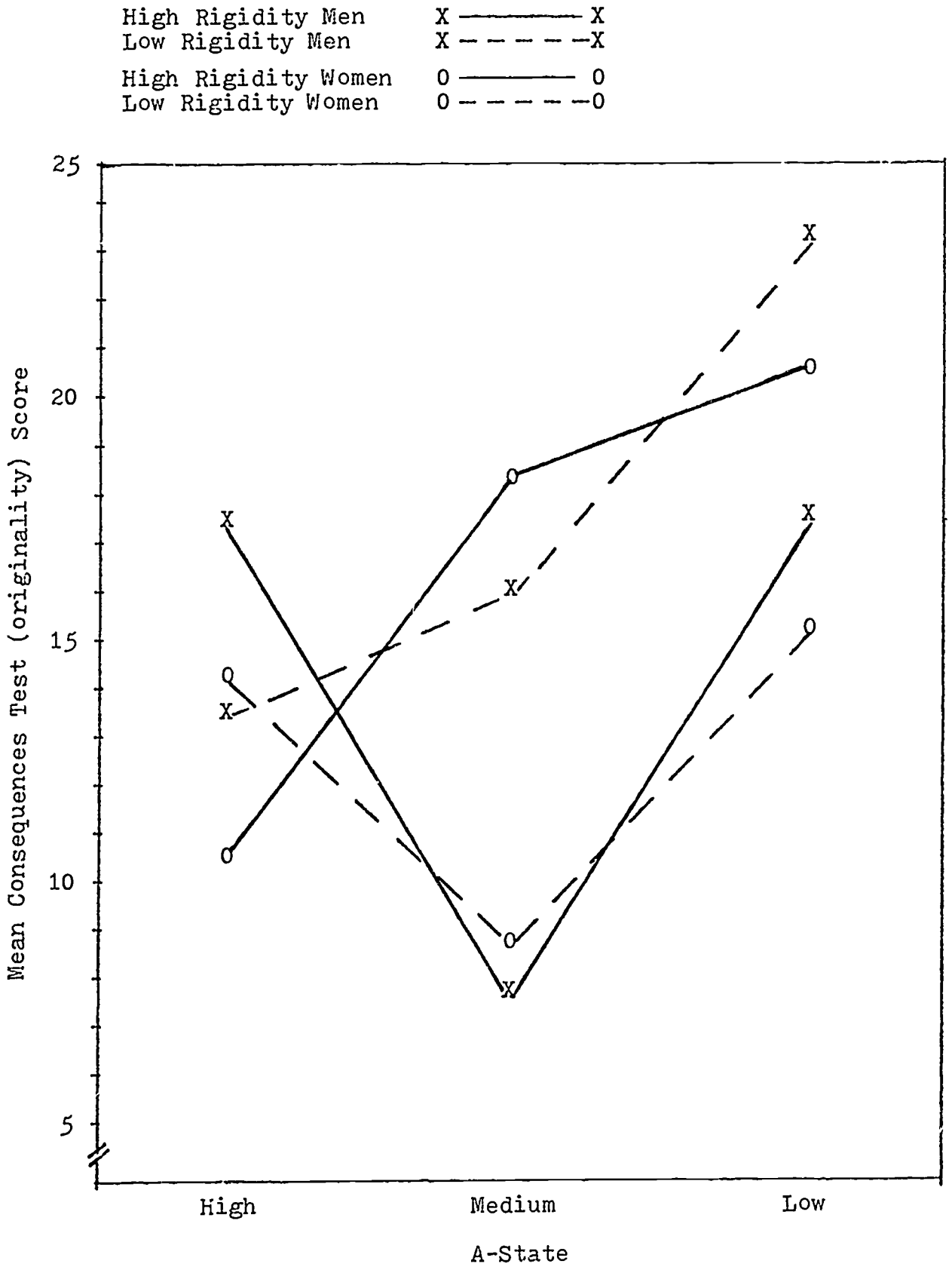


Figure 2. Consequences Test (originality) scores of High and Low Rigidity men and women as a function of A-State level.

Table 1

d statistics for nine between-sex contrasts
(A-Trait by Sex classification)

| | | MEN | | |
|---|---|---|---|---|
| | | HA | MA | LA |
| | HA | .76 | .71 | .53 |
| WOMEN | MA | .81 | .66 | .59 |
| | LA | 1.41 | .05 | 1.19 |

Table 2

d statistics for 36 between-sex contrasts
(A-State by Rigidity by Sex classification)

| | | MEN | | | | | |
|---|---|---|---|---|---|---|---|
| | | HRHA | HRMA | HRLA | LRHA | LRMA | LRLA |
| | HRHA | .89 | 1.00 | 1.01 | .38 | .83 | 1.63 |
| | HRMA | .15 | 1.47 | .03 | .66 | .22 | .59 |
| | HRLA | .38 | 1.71 | .27 | .90 | .45 | .35 |
| WOMEN | LRHA | .40 | .93 | .52 | .11 | .33 | 1.14 |
| | LRMA | 1.19 | .14 | 1.31 | .67 | 1.12 | 1.92 |
| | LRLA | .36 | .96 | .48 | .15 | .29 | 1.10 |